

**REVISED DRAFT FINAL
RECORD OF DECISION
TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT CONCORD
CONCORD, CALIFORNIA**

September 2001

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ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIWMB	California Integrated Waste Management Board
cm/s	Centimeter per second
COPC	Chemical of potential concern
CZMA	Coastal Zone Management Act
EPA	U.S. Environmental Protection Agency
ERA	Ecological risk assessment
FGC	Fish and Game Codes
FS	Feasibility study
HHRA	Human health risk assessment
HSC	Health and Safety Code
IMP	Installation Master Plan
IRP	Installation Restoration Program
LEL	Lower explosive limit
LUC	Land use controls
LUCIP	Land use control implementation plan
mg/L	Milligrams per liter
mg/kg	Milligrams per kilogram
msl	Mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPV	Net present value
O&M	Operation and maintenance
PRC	PRC Environmental Management Inc.
PRG	Preliminary remediation goal
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act

ABBREVIATIONS AND ACRONYMS (Continued)

RI	Remedial investigation
ROD	Record of decision
RWQCB	Regional Water Quality Control Board
SBD	Seal Beach Detachment
SI	Site investigation
SVOC	Semivolatile organic compound
SWRCB	State Water Resources Control Board
TBC	To-be-considered (regulation)
TDS	Total dissolved solids
TtEMI	Tetra Tech EM Inc.
UCL	Upper confidence limit
USC	United States Codes
VOC	Volatile organic compound
WESCO	Western Ecological Services Company, Inc.

1.0 DECLARATION STATEMENT FOR TIDAL AREA LANDFILL

1.1 SITE NAME AND LOCATION

The Tidal Area Landfill at Naval Weapons Station Seal Beach Detachment Concord (Naval Weapons Station SBD Concord), formerly known as Naval Weapons Station Concord, is located in Concord, California. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for the facility is CA7170024528.

On December 16, 1994, Naval Weapons Station SBD Concord was included on the National Priorities List. Naval Weapons Station SBD Concord is an active Naval base. The lead agency is the Department of the Navy, and the lead support agency is the U.S. Environmental Protection Agency (EPA). The source of funding for the cleanup is the U.S. Department of Defense, Defense Environmental Restoration Program.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Tidal Area Landfill at Naval Weapons Station SBD Concord in Concord, California, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is supported by information in the administrative record for the Tidal Area Landfill. The remedy is consistent with EPA presumptive remedy guidance for municipal landfill sites (EPA 1993, 1996b). This decision document satisfies requirements for the record of decision (ROD) under CERCLA. The signatures in Section 1.7 indicate approval of this ROD by EPA and the State of California.

1.3 ASSESSMENT OF THE SITE

The remedial action selected in this final ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances to the environment.

1.4 DESCRIPTION OF THE REMEDY

The selected remedial alternative described in this ROD addresses potential risks to human health and the environment posed by the Tidal Area Landfill at Naval Weapons Station SBD Concord. The major components of the selected remedy include the following:

- A native soil cap constructed to isolate and eliminate direct contact with refuse in the landfill and reduce erosion, infiltration, and potential contaminant migration. Surface controls will include ditches, if necessary, grading, and revegetation to reduce erosion and infiltration of surface water. The cap will have a minimum thickness of 3 feet and will cover an area of 13 acres.
- Land use and access restrictions to protect human health. Land use restrictions, instituted through the Installation Master Plan (IMP) or its equivalent planning document, consist of prohibitions on use of groundwater and use of the property for any purpose that will disturb the integrity of the cap. Implementation of the cap remedy would include posting warning signs to advise against intrusive activities that could compromise the integrity of the cap.
- Monitoring groundwater, landfill gas and the integrity of the landfill cap.

This ROD addresses only the Tidal Area Landfill, Site 1, and does not include the immediately surrounding R Area, Site 2. The immediately surrounding portion of Site 2 is within the potential area of influence of any hazardous material that could have migrated from Site 1. Site 2 is the subject of an independent study that will result in a separate ROD to identify remedial actions for the area, if necessary.

If ongoing studies in Site 2 or landfill monitoring at Site 1 indicate that Site 1 posed or poses risk to human health or the environment, the Navy agrees to notify the agencies signing this ROD and agrees to mitigate all risks, as required under CERCLA.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, and is cost effective. The selected remedy uses permanent solutions and satisfies the statutory requirements of CERCLA. In light of the volume of the waste, the heterogeneity of the landfill contents, and the absence of hot spots of contamination, treatment of the principal source of contamination was not deemed practical or cost effective. Therefore, this remedy does not satisfy the statutory preference for treatment as a principal

element. Remedial options other than the established presumptive remedy approach, including excavation of the landfill with consolidation and off-site disposal, were not formally evaluated in the feasibility study (FS), primarily because of the high cost associated with excavation and off-site disposal, potential uncertainties regarding the landfill contents, the lack of suitable areas for consolidation, and the potential for large-scale excavation and backfilling to damage surrounding sensitive environments. Any excavation or consolidation will occur at the perimeter of the landfill to minimize any potential disturbance of the area that surrounds the site (Tetra Tech EM Inc. [TtEMI] 1998b). For these reasons, and in accordance with EPA guidance on presumptive remedies, a containment technology was selected as the preferred alternative.

Because the remedy leaves potentially hazardous substances in the landfill above levels that allow for unlimited use and unrestricted exposure, the Navy will conduct a 5-year review in accordance with CERCLA Section 121(c). This review will ensure that the remedy continues to provide adequate protection of human health and the environment.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following Data Certification Checklist provides a roadmap to the ROD to identify the location of key elements of or to explain why these elements are not presented in the ROD. Inclusion of the ROD Data Certification Checklist fulfills a commitment by the EPA to the General Accounting Office to ensure that RODs contain certain key information on remedy selection (EPA 1999).

Checklist Item	Description
1. Chemicals of concern and their respective concentrations.	Chemicals of potential concern are characterized only at the landfill perimeter and not throughout the landfill. Chemicals of concern and their concentrations have not been evaluated and human health and ecological risk assessments have not been completed for the entire landfill because the waste has not been characterized, in accordance with the EPA's presumptive remedy guidance for landfills. A description of contamination at the site is presented in Section 2.5.1.
2. Baseline risk represented by the chemicals of concern.	Baseline risk assessment calculations are not required to implement EPA's presumptive remedy capping solution for landfills. Although not required, a focused human health risk assessment for the landfill perimeter only is presented in Section 2.7.1 of the ROD. A baseline ecological risk assessment is not a required element of the ROD and is, therefore, not included.

Checklist Item	Description
3. Cleanup levels established for chemicals of concern and the basis for these levels.	EPA's presumptive remedy (landfill cap) is a containment solution and does not include cleanup of the debris within the landfill. Cleanup levels are therefore not included in this ROD.
4. How source materials constituting principal threats area addressed.	Characterization of the landfill contents is not required to select and construct EPA's presumptive remedy, a landfill cap. However, some sampling has been completed both within the landfill and at its perimeter. Although organic and inorganic contaminants were detected as a result of the sampling effort, these contaminants are typical of landfills of this type; high concentrations of these contaminants were not commonly found and are not uniformly distributed throughout the landfill. The contaminants detected plus any unidentified hazardous materials constitute potential source areas for on-site contact or off-site migration of contaminants. The threats of potential contact and offsite contaminant migration are addressed by capping. Mitigation of potential threats is discussed in the ROD in Sections 2.9.1, 2.9.3, 2.9.4, and 2.9.5.
5. Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD.	<p>Current and anticipated future land uses at the landfill are discussed in Sections 2.6. Current and potential future beneficial uses of groundwater are discussed in Sections 2.6.1.</p> <p>Land use assumptions in the focused human health risk assessment are discussed in Section 2.7.1.</p> <p>Since use of groundwater is not anticipated in the Tidal Area of Naval Weapons Station Seal Beach Detachment Concord, this exposure pathway is not included in any risk assessment.</p>
6. Potential land and groundwater use that will be available at the site as a result of the selected remedy.	Potential land uses that will be possible at the site as a result of the selected remedy are discussed in Section 2.6.
7. Estimated capital, annual operation, and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.	The estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected are discussed in Section 2.9.7.
8. Key factors that led to selecting the remedy.	Key factors that lead to selecting the remedy are discussed in Sections 2.10 and 2.11.

1.7

AUTHORIZING SIGNATURES AND ACCEPTANCE OF REMEDY

Captain J. Steelman
Officer-in-Charge
Naval Weapons Station
Seal Beach Detachment Concord

Date

Branch Chief
Federal Facilities Cleanup Branch
U.S. Environmental Protection Agency Region IX

Date

Executive Director
California Regional Water Quality Control Board
San Francisco Bay Region

Date

Chief
Northern California Operations
Office of Military Facilities
California Department of Toxic Substances Control (DTSC)

Date

2.0 DECISION SUMMARY FOR TIDAL AREA LANDFILL

2.1 SITE NAME, LOCATION, AND DESCRIPTION

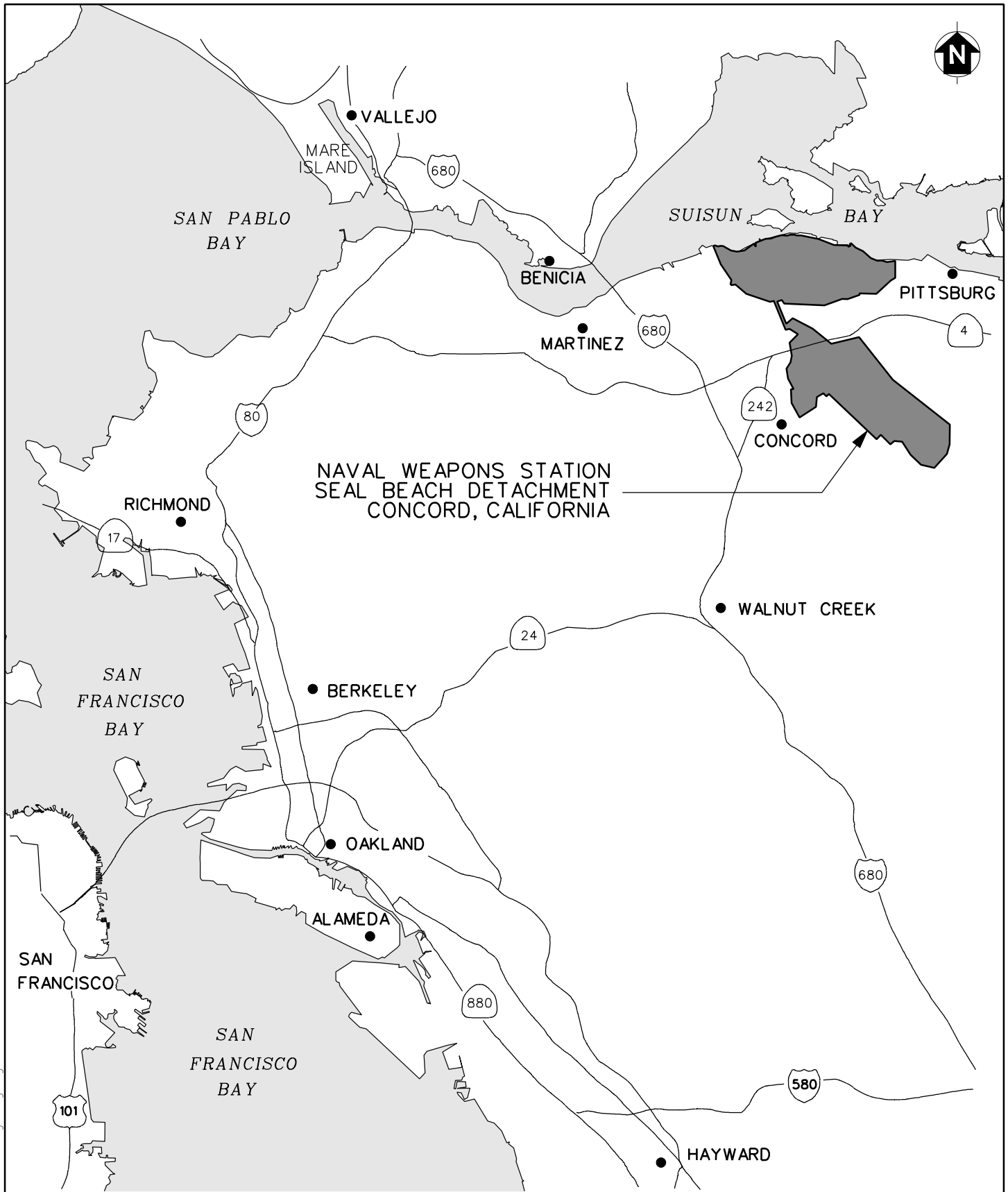
Naval Weapons Station SBD Concord is the major naval munitions transshipment facility on the West Coast and is located in the north-central portion of Contra Costa County, California, 30 miles northeast of San Francisco (Figure 1). The facility, which encompasses 13,000 acres, is bounded by Suisun Bay to the north, by Los Medanos Hills and the City of Pittsburg to the east, and by the City of Concord to the south and west. Currently, the facility contains three main, separate, land holdings: the Tidal Area (which includes islands in Suisun Bay), the Inland Area, and a radiography facility in Pittsburg, California (Figure 2).

The 6,800-acre Tidal Area is located in a low marsh adjacent to Suisun Bay. The Tidal Area Landfill (Site 1) is one of four Tidal Area sites investigated by the Navy under the Installation Restoration Program (IRP). The IRP was established to identify, assess, and remediate uncontrolled hazardous substance, pollutant, and contaminant sites that resulted from military activities (PRC 1995).

Endangered species and other wildlife inhabit portions of the Tidal Area, a majority of which is a wetland. A large section of the wetland was modified during construction of the original weapons station. Large amounts of fill material were placed in the wetland, and an artificial sluice was constructed to control tidal inflows.

The Tidal Area Landfill covers 13 acres and contains an estimated 33,000 tons of waste. The landfill served as the primary disposal area for Naval Weapons Station SBD Concord from 1944 to 1979. The landfill received household refuse from the base and surrounding communities, as well as facility waste and construction debris. A wetland area designated as a salt marsh exists adjacent to the landfill along its western and southern boundaries (Figure 3). The closest civilian population to the landfill is 1.3 miles away.

The Navy is continuing environmental investigations at the other three Tidal Area sites, the R Area, Site 2; the Froid and Taylor Roads site, Site 9; and the Wood Hogger site, Site 11. The Navy does not currently use Sites 2 and 9. The Wood Hogger site, Site 11, is currently used on an intermittent basis as a storage yard for scrap metal, wood, and portable wood hoggers. The location of each site is noted on Figure 3 with the exception of Site 11, which is south of the area shown on the figure. This ROD addresses only the Tidal Area Landfill.

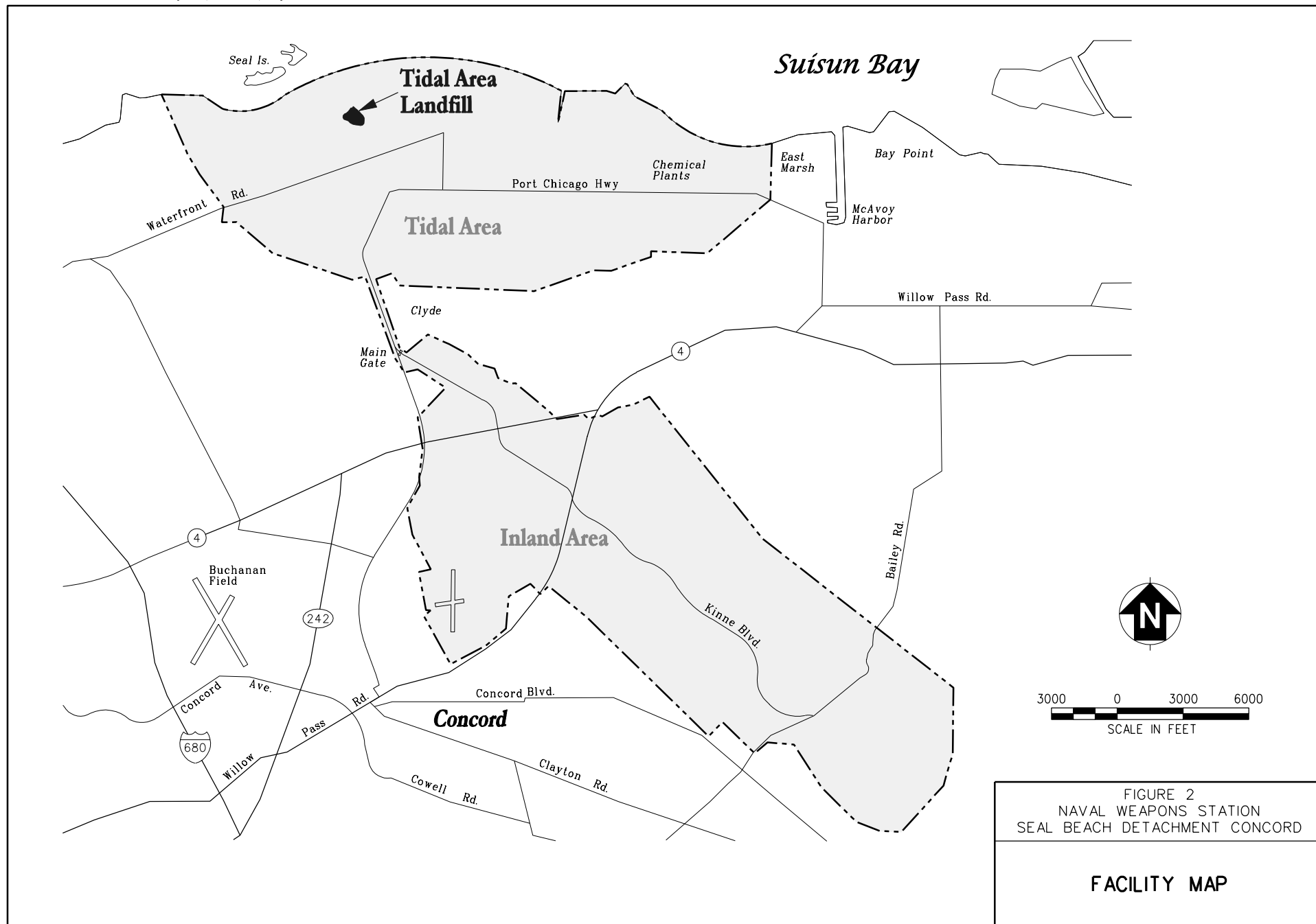


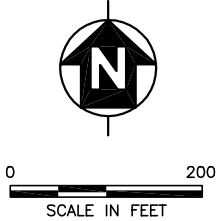
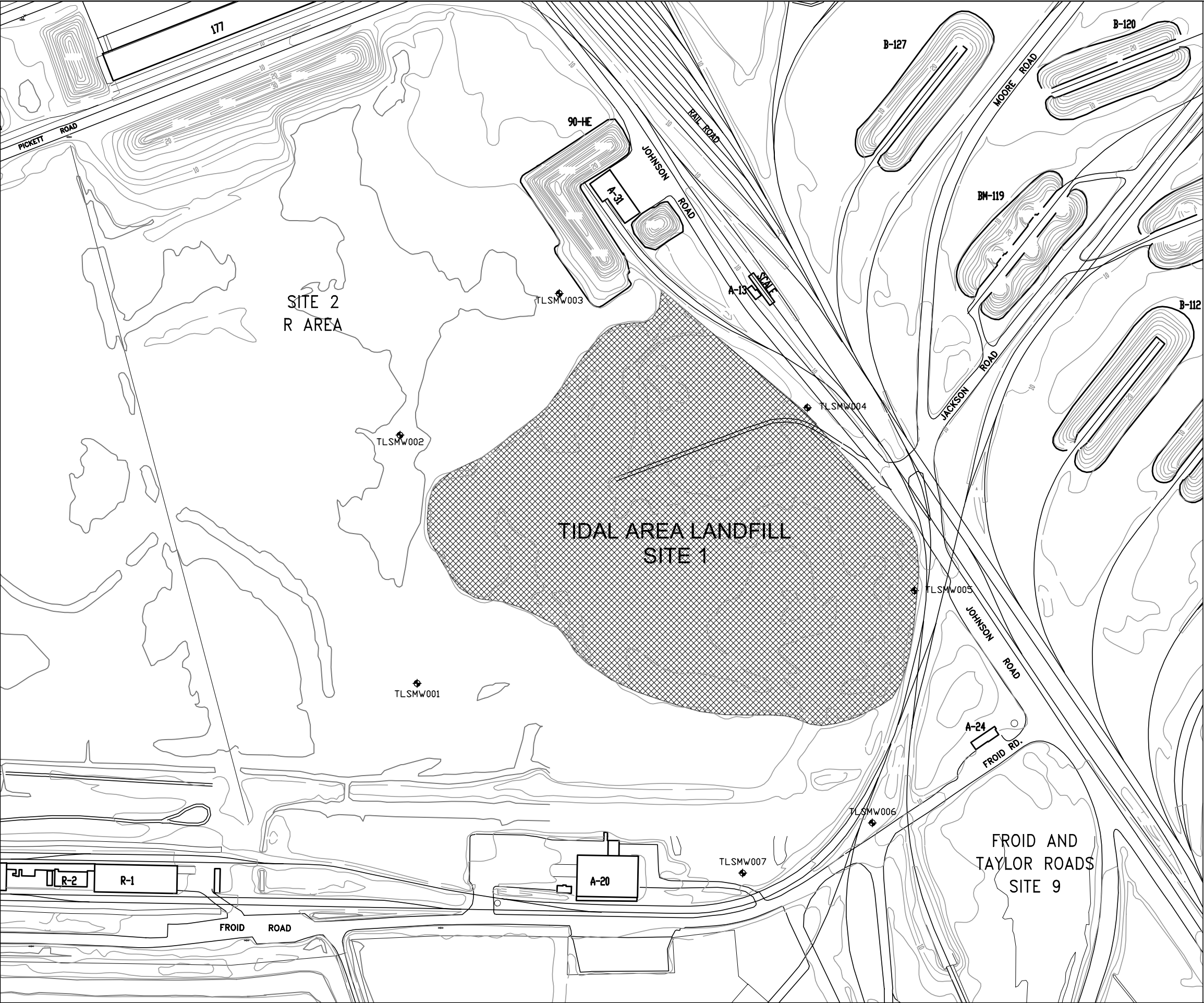
NAVAL WEAPONS STATION
SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA

FIGURE 1
NAVAL WEAPONS STATION
SEAL BEACH DETACHMENT CONCORD

FACILITY VICINITY MAP

0 2.5 5.0 7.5 10.0
SCALE IN MILES (APPROXIMATE)








- LEGEND:**
-  TIDAL AREA LANDFILL
 -  EXPLOSION DEFLECTION BERM
 -  IDENTIFICATION AND LOCATION OF GROUNDWATER MONITORING WELL
- TLSMW004

FIGURE 3
NAVAL WEAPONS STATION
SEAL BEACH DETACHMENT CONCORD

TIDAL AREA LANDFILL
SITE MAP

2.1.1 Geology and Topography

The Tidal Area of Naval Weapons Station SBD Concord, which includes the Tidal Area Landfill, is characterized by artificial fill material that overlies fine-grained Bay Mud sediments. Artificial fill material has been used in the Tidal Area to construct road and railroad beds, channel levees, structural pads, and protective revetments. The fill material was used to elevate portions of the base above the marsh plain, which is generally at or near mean sea level in the tidal area. The artificial fill used outside the area of the landfill is typically a mixed lithology that contains varying proportions of clay, silt, sand, and gravel. Artificial fill attains a maximum thickness of approximately 30 feet at the explosion deflection berms. The refuse that makes up the landfill is also considered artificial fill. Household refuse, facility waste, construction debris, metal debris, and soil were deposited directly on the surface of the marsh to form the landfill. Aerial photographs show no evidence of excavation at the landfill. Topographic maps indicate that refuse in the landfill extends 10 to 12 feet above the marsh plain.

Bay Mud underlies the fill material and the landfill and consists chiefly of silty clay with local horizons of peat. Near the Tidal Area Landfill, Bay Mud extends from the ground surface to a total explored depth of 20 feet below mean sea level (msl). Because the Bay Mud is not consolidated, the weight of the refuse in the landfill may have compressed the underlying Bay Mud to some extent. However, there is no lithologic evidence to indicate that the upper surface of the Bay Mud located underneath the landfill is depressed. Silty clay is the predominant lithology of the Bay Mud, although peat lenses are present beneath the landfill and a sand body is present in the area east of the landfill.

The landfill forms an asymmetric mound that reaches a maximum elevation of more than 12 feet above msl near its eastern edge along Johnson Road. The western half of the landfill is at an elevation of 6 to 8 feet above msl. The area adjacent to the Tidal Area Landfill consists of low-lying wetlands, including the R Area (Site 2), the Froid and Taylor Roads site (Site 9), and the Wood Hogger site (Site 11). The wetlands west of the landfill lie at an elevation approximately equal to mean sea level.

The extent of the Tidal Area Landfill depicted in Figure 3 encompasses the entire area where landfill debris and surface cover fill were placed on the former marsh. No horizontal buffer zone separates the landfill from Site 2. Physically, the boundary between the landfill and Site 2 is distinct because it is sharply defined by the toe of a fill slope. In addition, the distinction between the two sites is clear because the plant life changes from a pickleweed marsh on Site 2 to upland grasses and weeds on the landfill.

2.1.2 Hydrology

Naval Weapons Station SBD Concord lies within the boundaries of the Clayton Valley Groundwater Basin, as defined in the San Francisco Bay Water Quality Control Plan (Basin Plan). The existing and potential beneficial uses identified for this groundwater basin, which lies between 50 to 300 feet below ground surface, include the following: Municipal and Domestic Supply, Industrial Process Supply, Industrial Service Supply and Agricultural Supply. Groundwater at the Tidal Area Sites occurs in a shallow unconfined water-bearing zone that is predominantly composed of silty clays.

Shallow groundwater in the Tidal Area contains total dissolved solids (TDS) at levels that are significantly higher than the 3,000-milligrams per liter (mg/L) level the State Water Resources Control Board Resolution 88-63 sets as a maximum for a municipal or domestic water supply. TDS concentrations in the Tidal Area Sites range from 3,930 mg/L to 65,600 mg/L. TDS concentrations at the four Tidal Area Sites are generally very high. An average TDS concentration of more than 23,000 mg/L was detected in samples collected from 1990 to 1997 from the 23 wells in the Tidal Area. For comparison, the concentration of TDS in seawater typically is 35,000 mg/L.

Based on low specific yield and high TDS in samples from the monitoring wells, groundwater is not considered potable. There is no historical, existing, or planned use of the shallow groundwater in the Tidal Area as a source of drinking water.

Data obtained from groundwater monitoring wells surrounding the Tidal Area Landfill indicate that groundwater elevations in the eastern, elevated portion of the landfill are consistently higher than in the western edge of the landfill and the adjacent R Area, Site 2. Groundwater consistently flows west or southwest beneath the landfill during both the wet and dry seasons, except in the northern portion of the landfill, where groundwater locally flows northward toward Suisun Bay. The available data do not indicate that groundwater mounds beneath the landfill. However, the refuse in the landfill extends down to and below the groundwater table. Groundwater flow rates in the area are extremely slow because the silty clay that makes up the bulk of the Bay Mud does not readily transmit water. Groundwater flow velocities up to 2.2 feet per year were estimated from hydraulic parameters measured in 1998. Specific yields of the monitoring wells have not been measured, principally because of the difficulty in carrying out pumping tests in wells screened in Bay Mud. Sampling records indicate that wells at the landfill typically experienced significant drawdown at pumping rates of 0.1 liter per minute, suggesting that well yields

would be below 200 gallons per day. Groundwater elevations at the Tidal Area Landfill measured from December 1989 to January 1998 ranged from 3.20 feet below msl to 3.54 feet above msl. With the exception of a few wells or measurement periods, water levels in the wells at the site were highest near the end of the wet season and lowest near the end of the dry season. The response of water levels in landfill wells to seasonal rainfall in the area indicates that groundwater is recharged by infiltration of precipitation.

A confined sand body is present in the area east of the landfill. The sand body occurs about 16 feet below grade, is approximately 3.5 feet thick, and appears to terminate in the vicinity of the landfill. Groundwater was found to flow to the northwest within the sand body and was not sampled during the confirmation study because the sand body is not downgradient from the landfill (TtEMI 1998a). Surface water is not present at the landfill. The closest permanent surface water body is Otter Sluice, a manmade drainage canal that runs along the southwestern perimeter of the Tidal Area sites. At its closest point, Otter Sluice is about 750 feet from the Tidal Area Landfill. Tidal fluctuations in Otter Sluice cause localized reversals in the direction of groundwater flow in the area immediately adjacent to the sluice, but groundwater flow in the vicinity of the landfill is not affected by tidal fluctuations in Otter Sluice.

2.2 SITE HISTORY

The following sections provide a summary of the history and former environmental investigations of the Site 1.

2.2.1 Background

The Tidal Area at Naval Weapons Station SBD Concord is located on a site originally occupied by the Pacific Coast Shipbuilding Company. At that time, the area was known as “Bay Point.” The shipping company occupied the area north of what is now the Tidal Area Landfill. Otter Sluice was constructed to drain surface water and groundwater from the Tidal Area to Suisun Bay. The sluice is believed to have passed through the current location of the Tidal Area Landfill. During construction of Naval Weapons Station SBD Concord in 1942, the portion of this sluice that passed through the present location of the Tidal Area Landfill was backfilled and rerouted around the Tidal Area Landfill.

The Tidal Area Landfill is located along the western side of Johnson Road, just north of Froid Road (Figure 3). The landfill covers approximately 13 acres and contains an estimated 33,000 tons of waste.

The landfill served as the primary disposal area for Naval Weapons Station SBD Concord from 1944 to 1979.

Historical aerial photographs indicate, based on the growth of the landfill perimeter, that most of the waste was deposited in the landfill between 1959 and 1974. Household garbage from Naval Weapons Station SBD Concord and surrounding civilian communities, and shipboard waste, was disposed of at the landfill. The landfill reportedly received solvents, acids, paint cans, creosote-treated timbers, asphalt, concrete, asbestos, and ordnance materials including inert munitions.

According to the initial assessment study, tritonal from a 750-pound general-purpose bomb was reportedly buried in the landfill. The initial assessment study did not cite the source of information. Recent inquiries have not determined the information source. Navy sources consider the report of tritonal disposal to be highly unlikely event because the protocol for disposal of explosives does not include landfill disposal. Other safe and appropriate disposal methods for this type of material were in practice at the time. If tritonal was disposed in violation of Navy rules, it would be subject to degradation with exposure to the elements. The result of ongoing degradation is an increase in the stability of the material.

Historical photographs indicate that the Tidal Area Landfill was created by the progressive disposal of debris placed directly on native soil outward from Johnson Road. Apparently the area was not excavated before waste was discarded there. A waste thickness of up to 10 feet was estimated from topographic evaluation; however, the waste may be unevenly distributed, and the ratio of waste to soil cover in the fill may be variable. There is no record of the degree of subsidence of the landfill that resulted from consolidation of the underlying Bay Mud. The area is currently covered by soil; however, the origin of the soil cover is unknown. Presently, a fence borders the edge of the landfill along Johnson Road but does not surround the landfill.

As indicated in Section 2.1.2, Hydrology, groundwater levels in the vicinity of the Tidal Area Landfill have been measured up to 3.54 feet above msl. Because the waste has been measured at up to 10 feet thick at the landfill, it is clear that at least a portion of the landfill waste is inundated.

The horizontal extent of the landfill has been established with a high degree of certainty based on historical aerial photographs and visual site inspections. The boundary of the landfill on the east side is delineated by

a road; and on the south, north, and west sides, the boundary is visually apparent as a sudden change in slope from the flat wetland to the raised mound of the landfill

The landfill consists predominantly of ruderal non-native grassland habitat. The surface of the landfill is discontinuous soil cover that is mixed with waste throughout the depth of the landfill. Currently, rubble, metal scraps, and wood debris are visible through the soil layer. Animal burrows and differential subsidence have resulted in a highly uneven surface interrupted by deep potholes.

2.2.2 Summary of Environmental Activities

This section briefly describes the investigations of the Tidal Area Landfill and surrounding areas.

2.2.2.1 Historical Environmental Assessments of the Landfill

A summary of environmental investigations conducted at Naval Weapons Station SBD Concord before the remedial investigation (RI) is provided below. Although these investigations follow the IRP terms used before the Navy adopted EPA terminology, the investigations are consistent with the CERCLA process. The investigations concerned all four sites within the Tidal Area of Naval Weapons Station SBD Concord. However, the information summarized in the following paragraphs applies only to the Tidal Area Landfill.

The site was first investigated during an initial assessment study in 1983. The initial assessment study consisted of a search of historical records, a visual inspection of the site, and interviews with personnel at Naval Weapons Station SBD Concord. Based on the historical information, the site was recommended for further study. A site investigation (SI) of the Tidal Area Landfill was subsequently conducted from April 1988 to January 1991. Groundwater, surface water, soil, and sediment samples were collected within the Tidal Area Landfill. Results revealed volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons, the pesticide dieldrin, the polychlorinated biphenyl Aroclor-1260, metals, and the nitroaromatic explosive compound nitrobenzene. As a result, the Navy, in consultation with EPA and the California Environmental Protection Agency's (CalEPA) Department of Toxic Substances Control (DTSC), concluded that the presumptive remedy of capping the landfill should be implemented to prevent potential exposure to receptors. The Navy's intended use of the presumptive remedy approach was documented in December 1994 in the Remedial Investigation/Feasibility Study Tidal Area Sites Draft Final Work Plan.

The boundary of the Tidal Area Landfill site, as defined in the SI report, was larger than the current boundary shown in Figure 3. The site boundaries for the Tidal Area Landfill and Site 2 were modified for the RI to include the mudflats and marsh areas up to the toe of the Site 1 landfill. As a result, many of the SI sampling locations for the Tidal Area Landfill are now located outside the current boundary of the landfill and within the wetland area now called the R Area, Site 2.

A confirmation sampling study was conducted in 1993 to confirm the results of quarterly sampling during the SI. A limited number of soil, sediment, and groundwater samples were analyzed to verify the extent of organic constituents in groundwater. No organic compounds or pesticides were detected in these samples (PRC and MW 1993).

2.2.2.2 Remedial Investigation and Confirmation Groundwater Sampling Study for the Tidal Area

Data collected during the SI and the 1993 confirmation sampling study were used in planning the RI at the Tidal Area Landfill. A confirmation sampling study for groundwater was conducted in September and October 1997 to address outstanding issues that involved groundwater in the Tidal Area (TtEMI 1998a). Section 2.5 of this ROD describes the nature and extent of contamination at the Tidal Area Landfill and identifies the chemicals of potential concern based on RI screening criteria and the confirmation groundwater sampling study.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Navy formed a restoration advisory board on July 20, 1995. The restoration advisory board is made up of members of the community, the regulatory agencies, and the Navy. Since it was formed, the restoration advisory board has held regular public meetings to discuss the progress of environmental cleanup at Naval Weapons Station SBD Concord. Other community involvement efforts have included publishing notices of intent in local newspapers, distributing fact sheets within the community, and issuing press releases about the IRP.

The RI report on the Tidal Area Landfill was finalized in April 1997 (PRC 1997). The Tidal Area Landfill FS report was finalized in July 1998 (TtEMI 1998b). The RI and FS reports were made available to the public through the administrative record located at Naval Weapons Station SBD Concord and the City of Concord public library. The proposed plan for the Tidal Area Landfill, which identifies the Navy's

preferred alternative, was made available to the public on June 8, 1999. The notice of availability for the proposed plan was published in the *Contra Costa Times* on June 8, 1999. The public comment period was held from June 8 through July 8, 1999. A public meeting was held on June 17, 1999. Representatives from the Navy, EPA, and the State of California answered questions at this meeting about the proposed alternative for the Tidal Area Landfill at Naval Weapons Station SBD Concord. The Navy has responded in writing to comments received during the public comment period. These responses are contained in the responsiveness summary, which is Part 2 of this decision document (Appendix A). These community participation activities fulfill the requirements of Sections 113(k)(2)(B)(i-v) and 117(a)(2) of CERCLA.

2.4 SCOPE AND ROLE OF REMEDIAL ACTION

Thirty-one sites have been identified under the IRP at Naval Weapons Station SBD Concord. These 31 sites are divided among the following areas: (1) Tidal Area; (2) Litigation Area; and (3) Inland Area. Four sites (1, 2, 9, and 11) have been identified as potential areas of concern at the Tidal Area of Naval Weapons Station SBD Concord. These sites are currently being investigated. The overall strategy for the installation is to accelerate remedial and removal actions at each individual site rather than waiting for characterization to be completed at all sites. Site 1, the Tidal Area Landfill, is ready for implementation of the remedy. This ROD addresses only the Tidal Area Landfill.

The RI/FS for the Litigation Area (Sites 3, 4, 5, 6, 25, 26, and 28) was completed in 1988, the ROD was signed in 1989, and the remedial actions were completed in 1996. The fifth year of monitoring in the Litigation Area has been completed and the success of remediation is evaluated in the Draft Five Year Periodic Review Assessment report. The RI for the Inland Area (Sites 13 and 17) is complete. A no action proposed plan (PP) and ROD are in progress for Inland Area Sites 13, and 17. The ROD will be finalized in 2001. Sites 22, 27, 29, 30, and 31 are proposed for further study or remedial activities. The remaining 13 sites (Sites 7, 8, 10, 12, 14, 15, 16, 18, 19, 20, 21, 23, and 24) are considered no further action sites.

2.5 SUMMARY OF SITE CHARACTERISTICS

2.5.1 Nature and Extent of Contamination

The SI completed in 1991 revealed that VOCs, SVOCs, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, and metals were present within the landfill itself. As a result of the SI, an RI was conducted to evaluate whether contaminants were migrating outward from the landfill.

Surface and subsurface soil and groundwater samples were collected during the RI around the perimeter of the landfill to assess potential migration of chemicals. Samples of surface water were not collected at the Tidal Area Landfill during the RI because no surface water exists at the landfill. Because of the heterogeneous nature of the contents of the landfill and recognition that capping is the most likely remedy, based on the EPA guidance document *Presumptive Remedy for CERCLA Municipal Landfill Sites* [1993], the RI did not attempt to fully characterize the contents of the landfill. Instead, samples were collected at nine locations around the perimeter of the landfill, and 24 samples were collected, analyzed, and compared with 1996 EPA Region IX and California-modified residential preliminary remediation goals (PRG) (EPA 1996a) and ambient levels for metals. PRGs are calculated from current EPA toxicity values with “standard” exposure factors to estimate concentrations in soil and groundwater that are protective of human health over a lifetime. Residential PRG values are lower than industrial PRG values. California-modified PRGs are derived using State of California EPA toxicity values.

Only one organic compound was detected in samples of soil at a concentration greater than its residential PRG. The polynuclear aromatic hydrocarbon benzo(a)pyrene was detected in samples of surface soil from the western edge of the landfill. Two metals, arsenic and lead, were detected at concentrations greater than the residential PRGs (0.38 milligrams per kilogram [mg/kg] for arsenic and 130 mg/kg for lead) and the estimated ambient concentrations (24 mg/kg arsenic and 61 mg/kg lead). Arsenic was detected in surface and subsurface soil samples at concentrations up to 57.6 mg/kg. Lead was detected in surface soil samples at concentrations ranging from 5.3 to 156 mg/kg. Arsenic was the only compound considered a chemical of concern for the landfill during the human health risk assessment (HHRA).

Results for groundwater samples, including results from the 1998 confirmation groundwater sampling event, indicate that organic compounds are not present in groundwater near the Tidal Area Landfill. Metals (arsenic, chromium, iron, nickel, and zinc) were detected in groundwater, but only at concentrations

that were comparable to concentrations detected in other wells both up- and down-gradient from the landfill. Isolated areas of comparatively high concentrations characterize the geographic distribution of metals in groundwater. Most of the highest metals concentrations were detected in samples from Site 2, which is hydraulically downgradient from the landfill, but high concentrations of metals were also detected in samples from upgradient wells at the eastern edge of the landfill. The data for metals do not show evident plumes of groundwater contaminated by metals emanating from the landfill. Instead, the distribution suggests that concentrations of metals at Site 2 are caused by evaporative processes that concentrate metals that are already generally present in groundwater throughout the site (TtEMI 1998a). Data for metals collected to date show that concentrations in groundwater are static and exhibit no long-term trend. The results of the 1998 confirmation groundwater sampling event, including the concentrations of inorganic constituents detected in groundwater in the Tidal Area, are presented in “Technical Memorandum: Confirmation Sampling in the Tidal Area Sites” (TtEMI 1998a).

2.5.2 Conceptual Site Model and Contaminant Fate and Transport

The conceptual site model encompasses the migration pathways for migration of contaminants from the Tidal Area Landfill. These migration pathways are through wind transport of surface soil that may contain contaminants or through leachate migration in groundwater to surface water. Installation of a cap over the cover soil at the landfill is expected to effectively eliminate windborne migration of contaminants from the landfill. The only chemical of concern in surface soil at the Tidal Area Landfill is arsenic. Lead was not identified as a chemical of concern during the HHRA. Although concentrations of arsenic in surface soil at the landfill exceeded the 1996 EPA Region IX residential PRG for arsenic, ambient concentrations of arsenic are high throughout the Tidal Area sites and in the upland reference area.

The potential cannot be ruled out for precipitation that infiltrates through the landfill to leach and mobilize contaminants from the landfill via groundwater discharge to surface water. However, repeated groundwater sampling from 1990 to 1998 has shown no evidence that contaminated groundwater is migrating from the landfill. Organic compounds are not present in groundwater downgradient from the landfill, and concentrations of metals are comparable up- and down-gradient from the landfill. The hydrogeologic and lithologic characteristics of the Bay Mud are expected to severely restrict migration of contaminants from the landfill. Groundwater flow velocities on the order of 1 to 2 feet per year have been estimated in the vicinity of the landfill (TtEMI 1998a). Additionally, the Bay Mud in the vicinity of the landfill contains abundant organic material, and it is likely that natural adsorption of contaminants onto the

organic matter within the Bay Mud would significantly retard movement of contaminants in any potential leachate that infiltrates into the Bay Mud. Consequently, based on existing data, migration of leachate from the landfill is not expected to transport contaminants to surface water.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

At present and for the last 21 years, human contact with the landfill has been extremely limited because the landfill has been inactive for disposal or any other purpose. The greatest amount of human contact with the landfill has been the result of the CERCLA investigations. The presence of exposed waste, physical depressions and voids at the site as a result of waste decay make the landfill potentially dangerous for human contact due to physical hazards.

The landfill does not support good wildlife habitat because the waste is exposed and lacks the necessary plant life to support native animals. The quality of the habitat is has not been assessed because assessment is unnecessary and impractical when a landfill presumptive remedy cap is implemented.

After construction of the cap, there is no proposed change in future land use because Naval Weapons Station SBD Concord is expected to remain a military facility without significant opportunities for public access. If land use at the facility is changed, the long-term land use is intended to be non-irrigated open space. Human recreational use of the landfill area is conceivable because it is not an uncommon use for appropriately closed municipal landfills in the San Francisco Bay Area.

After the cap is constructed and the surface of the cap is revegetated, the waste will be isolated from contact with animals and the plant life may provide a source of food for animals. As such, the landfill is expected to become better habitat for animals than it is now. The landfill will not, however, match the habitat at Site 2 or resemble the ecologically sensitive, high-quality marshland habitat where the landfill was originally constructed.

2.7 SUMMARY OF SITE RISKS

The Navy has not characterized the contents of the landfill, consistent with EPA's presumptive remedy guidance, because Site 1 is proposed for capping using a presumptive remedy. The presumptive remedy cap and associated land use controls preclude use of the landfill area for residential or industrial purposes and would prevent human contact with materials in the landfill. Therefore, a quantitative human health

risk assessment was not completed for refuse in the landfill. For the same reason, an ecological risk assessment (ERA) was not conducted at the Tidal Area Landfill because the required subsequent landfill closure would interrupt the relevant exposure pathways and eliminate any potential ecological risk. EPA's presumptive remedy guidance does not recommend evaluation of human health or ecological risk for the contents of a landfill.

Although risks at Site 1 have not been quantified for humans or ecological receptors, the Navy has attempted to characterize site risks posed by Site 1 on the adjoining area of Site 2. This work was submitted for agency review as a Draft Final RI for Tidal Area Sites 1, 2, 9, and 11 (TtEMI 1999¹). The Draft Final RI has not been approved, and a revised version of the report will be completed for agency review in the spring of 2002. The ROD for Site 2 will address all site risks and mitigation measures within Site 2 caused by contaminant migration from Site 1, if present.

The Navy previously conducted a focused HHRA for the perimeter area of Site 1 (TtEMI 1999). The HHRA evaluated the potential effects to human health associated with exposure to potential pollutants (chemicals) from soil at the perimeter of the landfill. Because the soil included within the focused HHRA are to be entirely capped by construction of the landfill cover, the findings of the focused HHRA are not applicable to future conditions at the site. The focused HHRA is summarized below because it demonstrates that only slight risk is predicted at the perimeter of the landfill, assuming no capping of the landfill using the conservative residential human exposure scenario. Because residential exposure is unlikely in the future, the risk calculation should be considered an upper bound estimate for the perimeter of the landfill without a cap.

No ecological risk assessment for the landfill perimeter is presented in this ROD because an ecological risk assessment has not been completed for Site 2 and because no quantitative ecological risk assessment is available for soil at the perimeter of the landfill.

2.7.1 Human Health Risk Assessment

The objective of the human health risk assessment conducted for the perimeter of the Tidal Area Landfill was to evaluate the potential carcinogenic risks and noncarcinogenic hazards associated with exposure to

¹ Although the title of the RI includes Site 1, contaminants in Site 1 have not been characterized. To avoid confusion, the revised version of the Draft Final RI will not include Site 1.

chemicals of potential concern (COPC) detected in soil samples collected at the perimeter of the landfill. As noted in Section 2.7 above, the risk assessment is limited to a focused review and is not required under the presumptive remedy guidance. The focused risk assessment was not conducted to evaluate the current level of risk for the entire uncapped landfill.

The COPCs for soil evaluated in this focused risk assessment included metals, SVOC including polynuclear aromatic hydrocarbons, pesticides, and polychlorinated biphenyls. Soil was the only media evaluated at the perimeter of the Tidal Area Landfill.

Naval Weapons Station SBD Concord is within the boundaries of the Clayton Valley Groundwater Basin, as defined in the San Francisco Bay Area Water Quality Control Plan (Basin Plan). The existing and potential beneficial uses identified for this groundwater basin, which lies between 50 to 300 feet below surface, include the following: Municipal and Domestic Supply, Industrial Process Supply, Industrial Service Supply and Agricultural Supply. Groundwater at the Tidal Area Sites occurs in a shallow unconfined water-bearing zone that is predominantly composed of silty clays. TDS levels in this shallow groundwater are significantly higher than the 3,000-mg/L level, set in California State Water Resources Control Board (SWRCB) Resolution 88-63 as a maximum for a municipal or domestic water supply. TDS in the Tidal Area Sites ranges from 3,930 mg/L to 65,600 mg/L. There is no historical, existing, or planned use of the shallow groundwater in the Tidal Area as a source of drinking water. As a result, groundwater was not evaluated as a media of concern at any of the Tidal Area sites at Naval Weapons Station SBD Concord.

Potential carcinogenic risks and noncarcinogenic hazards associated with exposure to chemicals of potential concern detected in soil at the perimeter of the landfill were calculated using a focused approach that is consistent with EPA (1996a) and DTSC (1994) guidance on use of EPA Region IX PRGs in screening risk assessments at military facilities. Specifically, carcinogenic risks and noncarcinogenic hazards are derived for residential and industrial land-use scenarios based on the ratio of detected concentrations of contaminants to 1996 EPA Region IX PRGs. PRGs are health-based concentrations in soil for individual chemicals that correspond to a risk of 1×10^{-6} or a noncarcinogenic hazard quotient of 1. For the risk evaluation, the contaminant concentration is the average concentration (the upper 95 percent confidence limit on the arithmetic mean [95 UCL]).

Currently, base personnel do not work at the Tidal Area Landfill, and future land use is not likely at the site in light of the purpose of Naval Weapons Station SBD Concord. Although the presence of debris renders the landfill area unsuitable for construction of buildings, the initial screening in the HHRA conservatively assumed that future land use will be unrestricted and that new buildings or residences will be constructed in the area. Consequently, the following receptors were evaluated in the HHRA: industrial worker and resident.

The results of the HHRA for the perimeter of the Tidal Area Landfill are summarized below. To focus the presentation and evaluation of the results of the risk assessment, the magnitudes of the estimated carcinogenic risks and hazard indices are discussed relative to remedial action goals defined by EPA. For carcinogens, the goal is an incremental lifetime cancer risk to an individual from exposure to site contamination of between 1×10^{-4} and 1×10^{-6} , which for the following discussion is referred to as the EPA target risk range. For noncarcinogens, the goal is a hazard index that does not exceed 1.

For an industrial worker, the carcinogenic risks associated with reasonable maximum exposure to COPCs in surface soil (2×10^{-5}) and subsurface soil (9×10^{-6}) are within EPA's target risk range. The risks for a worker are attributable to arsenic, which is the only chemical of concern (that is, a chemical for which the chemical-specific risk exceeds 1×10^{-6}). The hazard indices for surface soil (0.1) and subsurface soil (0.06) are less than the threshold value of 1.

For a resident, the carcinogenic risks associated with reasonable maximum exposure to COPCs in surface soil (9×10^{-5}) and subsurface soil (5×10^{-5}) are within EPA's target risk range. The risks for a resident are attributable to the sole chemical of concern, arsenic. The hazard indices for surface soil (2.3) and subsurface soil (1.5) exceed the threshold value of 1.

The above risk assessment is limited to the evaluation of soil at the landfill perimeter and does not assess risk posed by the contents of the landfill that are currently exposed at the site. Additional risk assessment of the site is not required under CERCLA presumptive remedy guidance.

2.7.2 Ecological Risk Assessment

In accordance with EPA guidance (1993), the Navy followed the presumptive remedy approach for the Site 1 landfill. The use of a presumptive remedy (containment) permits elimination of an ERA for the

landfill because the presumptive remedy involves closure by construction of a landfill cap. This cap would interrupt the relevant exposure pathways, thus eliminating potential ecological risk. In addition, the landfill cap will radically alter the ruderal habitat on the surface of the landfill, making an ecological risk assessment of the area inappropriate.

Surface water runoff and migration of contaminants in soil are the sole potential exposure pathways that would transport potential pollutants (hazardous substances) from Site 1 to Site 2 before the containment remedy is implemented. As a result, the adjacent Site 2 is the only viable wildlife habitat potentially affected by the landfill (TtEMI 1999). The Navy is conducting an RI, including an ERA, for the habitat at Site 2. The Site 2 risk assessment includes data for samples collected in an area of Site 2 where potential impacts from the Site 1 landfill would be identified. The ERA includes chemical analysis of samples of sediment, surface water, and plant and animal tissues, as well as endangered species surveys in Site 2.

In the event that the RI in Site 2 finds that pollutants pose an unacceptable risk to human health or ecological receptors, the Navy will notify the agencies. After the agencies have been notified, the Navy will conduct a feasibility study of potential remedial alternatives for Site 2 in accordance with CERCLA.

2.8 DESCRIPTION OF ALTERNATIVES

In June 1999, the Navy presented the “Tidal Area Landfill Proposed Plan” for Naval Weapons Station Seal Beach, Detachment Concord (NWSSB Detachment Concord), to the public. The proposed plan described the Navy’s proposed approach to addressing contamination at the Tidal Area Landfill and summarized the proposed remedial alternatives under consideration in the FS report. Descriptions of the alternatives presented in this ROD are also summarized in the proposed plan.

The FS report and the subsequent proposed plan drew on EPA’s presumptive remedy approach in identifying and evaluating remedial alternatives. EPA has developed presumptive remedies to accelerate cleanup for certain types of sites. Presumptive remedies are preferred technologies based on an evaluation of performance data from previous technology implementation. Title 40 of the Code of Federal Regulations (CFR) 300.430 (a)(1)(iii)B (the NCP) sets forth the expectation that engineering controls, such as containment, will be used for sites with relatively low-level threats or where treatment is impracticable. Therefore, EPA has established source containment as the presumptive remedy for

CERCLA municipal (and appropriate military) landfills (EPA 1996b). The presumptive remedy is appropriate for the Tidal Area Landfill.

The remedial action objectives (RAO) for Site 1 were developed using the following EPA guidance documents: “Conducting RI/FS Studies for CERCLA Municipal Landfill Sites” (EPA 1991) and “Presumptive Remedy for CERCLA Municipal Landfill Sites” (EPA 1993). Alternatives were developed with the goal of attaining these RAOs:

- Protect human health and environmental receptors from contact with landfill contents.
- Protect human health and the environment from exposure to leachate.
- Protect human health and the environment from subsurface landfill gas migration.

Three remedial alternatives were developed and address the RAOs to varying degrees. The alternatives assembled for the landfill are as follows:

- Alternative 1: No Action, Groundwater and Landfill Gas Monitoring
- Alternative 2: Containment (Native Soil Cap), Institutional Controls, and Groundwater and Landfill Gas Monitoring
- Alternative 3: Containment (Multilayer Cap), Institutional Controls, and Groundwater and Landfill Gas Monitoring

The remedial alternatives involve combinations of process options, including landfill gas monitoring, grading, revegetation, post-closure groundwater monitoring, and post-closure maintenance of the cap. Each alternative was analyzed in detail during the FS. The applicable or relevant and appropriate requirements (ARAR) that are pertinent to the alternatives are summarized in Section 2.8.1. The alternatives are described in Sections 2.8.2, 2.8.3, and 2.8.4 of this ROD.

2.8.1 Applicable and Relevant and Appropriate Requirements

This section identifies federal and state of California ARARs from the universe of regulations, requirements, and guidance and sets forth the Navy’s determinations of ARARs for the selected remedy for Site 1, the Tidal Area Landfill at Naval Weapons Station SBD Concord.

2.8.1.1 Summary of CERCLA and NCP Requirements

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, 42 *United States Code* [USC] § 9621[d]), as amended, states that remedial actions on CERCLA sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. An applicable federal requirement is an ARAR. An applicable state requirement is an ARAR only if it is more stringent than federal ARARs.

If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations similar to the circumstances of the proposed remedial action and are well suited to the conditions of the site. A requirement must be determined to be both relevant and appropriate in order to be considered an ARAR.

The criteria for determining relevance and appropriateness are listed in 40 CFR § 300.400(g)(2) and include the following:

- the purpose of the requirement and the purpose of the CERCLA action;
- the medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site;
- the substances regulated by the requirement and the substances found at the CERCLA site;
- any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site;
- the type of place regulated and the type of place affected by the release or CERCLA action;

- the type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action; and
- any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resources at the CERCLA site.

According to CERCLA ARARs guidance, a requirement may be “applicable” or “relevant and appropriate,” but not both. Identification of ARARs must be done on a site-specific basis and involve a two-part analysis: first, a determination whether a given requirement is applicable; then, if it is not applicable, a determination whether it is nevertheless both relevant and appropriate. It is important to explain that some regulations may be applicable or, if not applicable, may still be relevant and appropriate. When the analysis determines that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable.

Tables 1, 2, 3, and 4 included in this ROD present each ARAR for the selected remedy with a determination of ARAR status (i.e., applicable, relevant and appropriate, or to be considered [TBC]). For the determination of relevance and appropriateness, the pertinent criteria were examined to determine whether the requirements addressed problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated, and whether the requirement was well suited to the site. The FS for the Tidal Area Landfill includes a more detailed ARARs analysis.

To qualify as a state ARAR under CERCLA and the NCP, a state requirement must be:

- a state law,
- an environmental or facility siting law,
- promulgated (of general applicability and legally enforceable),
- substantive (not procedural or administrative),
- more stringent than the federal requirement,
- identified in a timely manner, and
- consistently applied.

To constitute an ARAR, a requirement must be substantive. Therefore, only the substantive provisions of requirements identified as ARARs in this ROD are considered to be ARARs. Permits are considered to

be procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations that were determined to be procedural or non-environmental, including permit requirements, are not considered to be ARARs. CERCLA 121(e)(1), 42 USC § 9621(e)(1), states that “No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section.” The term *on-site* is defined for purposes of this ARARs discussion as “the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action” (40 CFR § 300.5).

Nonpromulgated advisories or guidance issued by federal or state governments are not legally binding and do not have the status of ARARs. Such requirements may, however, be useful, and are “to be considered” (TBC). TBC (40 CFR § 300.400[g][3]) requirements complement ARARs but do not override them. They are useful for guiding decisions regarding cleanup levels or methodologies when regulatory standards are not available.

As the lead federal agency, the Navy has primary responsibility for identifying federal ARARs at Naval Weapons Station SBD Concord. The DTSC is responsible for identifying and advising the Navy of state ARARs relating to the site. In 1993, the Navy formally requested ARARs from the state for all Tidal Area sites and responses were received from the following agencies:

- San Francisco Bay Regional Water Quality Control Board (RWQCB)
- DTSC
- Department of Fish and Game
- San Francisco Bay Conservation and Development Commission (BCDC)

The information received from the state agencies was not specific to the site. The Navy has since met with state regulatory agency representatives informally to discuss ARARs specific to Site 1. Based on these meetings, this ROD contains the final determination of state requirements that apply to the Tidal Area Landfill site.

ARARs common to the alternatives are discussed below. A more detailed discussion of the ARARs that apply to the selected alternative is contained in Section 2.11.2 of this ROD.

2.8.1.2 Chemical-Specific ARARs:

Chemical-specific ARARs are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in the establishment of a cleanup level. Air and soil are the environmental media potentially affected by the Site 1 response actions. The conclusions for ARARs pertaining to these media are presented below.

Chemical-specific ARARs do not exist for soil or landfill refuse.

Requirements for control of landfill gas at solid waste landfills under either Subtitle D of the Resource Conservation and Recovery Act (RCRA) (40 CFR § 258), or Title 27 of the California Code of Regulations (27 CCR § 20921 et seq.) were considered as potential ARARs. Because the landfill stopped receiving waste prior to the effective date of Subtitle D of RCRA (October 9, 1991), RCRA standards are not applicable. However, RCRA landfill gas control requirements of Subtitle D (40 CFR § 258.23) are relevant and appropriate because methane gas is a common hazard created by landfill decomposition. Additionally, the Navy has identified the methane gas control requirements of Title 27 (27 CCR § 20921) as applicable because the landfill did not complete closure pursuant to regulations in effect at the time waste was last received. The Navy has reviewed and compared both sets of requirements and determined that the standards of Title 27 are more stringent than the RCRA Subtitle D standards.

Therefore, the following standards of Title 27 are ARARs:

- Section 20921(a)(2), which requires that landfill gas be monitored to ensure that methane gas concentrations at site boundaries do not exceed the lower explosive limit (LEL) for methane (5 percent methane by volume)
- Section 20921(a)(3), which requires that trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds

Chemical-specific ARARS are summarized in Table 1.

2.8.1.3 Location-Specific ARARs

Location-specific ARARs are restrictions on the concentrations of hazardous substances or the conduct of activities as a result of the characteristics of the site or its immediate environment. Location-specific ARARs for the Tidal Area Landfill are summarized in this section. Federal location-specific ARARS are

summarized in Table 2 and State of California location-specific ARARS are summarized in Table 3. Biological resources, wetlands protection, floodplain management, and coastal resources are the resource categories relating to location-specific requirements potentially affected by the Site 1 response actions. The ARARs conclusions pertaining to these resources are summarized below.

Biological Resource ARARs

Biological resource ARARs may be either federal or state requirements, as described below.

Federal

Endangered Species Act: The Endangered Species Act (ESA) of 1973 (16 USC §§ 1531-1543) provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction. The ESA defines an endangered species and provides for the designation of critical habitats. Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. Under Section 7(a) of the ESA, federal agencies must carry out conservation programs for listed species. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented. Consultation regulations at 50 CFR § 402 are administrative in nature and therefore are not ARARs. However, they may be TBCs to comply with the substantive provisions of the ESA.

No endangered, threatened, or otherwise protected species are known to inhabit the surface of the landfill. However, threatened and endangered species, including the salt marsh harvest mouse, may inhabit areas near the landfill, so precautions will be taken to ensure that the remedial action does not adversely affect any threatened or endangered species. Section 7(a) is thus included as an ARAR for the Tidal Area Landfill.

State

California Endangered Species Act: The California Endangered Species Act is set forth in California Fish and Game Code §§ 2050 through 2068, 2070, 2080, and 2090 through 2096. Sections 2050-2068 and 2070 are procedural and non-substantive and §§ 2090 through 2096 are not effective after January 1, 1994. Section 2080 prohibits the take of endangered species. As explained above, no threatened or

endangered species inhabit the landfill; however, because threatened and endangered species, including the salt marsh harvest mouse, may inhabit areas near the landfill, precautions will be taken to ensure that the remedial action does not adversely affect any threatened or endangered species. For this reason, Section 2080 is considered relevant and appropriate.

Other Wildlife Protection Statutes: In addition to the California Endangered Species Act, the following Fish & Game Code provisions were identified by the state as potential ARARs: Sections 3005, 3511, 3513, and 5650. Sections 3005(a) and 3511 prohibit the taking or possession of birds and mammals by trapping, netting, or with poisonous substances. Section 3513 prohibits the taking of protected birds such as the California Clapper Rail. Section 5650 prohibits the deposition of toxic materials into waters of the state that would have a deleterious effect on a species or habitat. Based on its review of these provisions, the Navy has listed §§ 3005(a), 3511 and 5650(a) and (b) as relevant and appropriate requirements for actions at the Site 1 landfill. Other sections of these provisions are administrative or procedural and therefore are not considered ARARs. There are no migratory birds at the landfill site so § 3513 is not an ARAR.

Wetlands Protection and Floodplain Management ARARs

The following federal requirements were considered as potential ARARs in the FS for Site 1:

- Executive Order No. 11990, Protection of Wetlands
- Executive Order No. 11988, Floodplain Management
- Clean Water Act Section 404, 33 USC § 1344.

Each of these requirements is discussed below. No state location-specific ARARs for wetlands and floodplain management were identified.

Flood Plain Management, Executive Order 11988: Under 40 CFR § 6.302(b), federal agencies are required to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effect associated with direct and indirect development of a floodplain. Executive Order 11988 is a TBC.

Protection of Wetlands, Executive Order 11990: Executive Order No. 11990 requires that federal agencies minimize the destruction, loss or degradation of wetlands; preserve and enhance the natural and beneficial value of wetlands; and avoid support of new construction in wetlands if a practicable alternative exists. Wetlands are defined in Executive Order 11990 as areas inundated by surface or groundwater with a frequency sufficient to support, under normal circumstances, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated conditions for growth or reproduction. Jurisdictional wetlands do not exist within the Tidal Area Landfill since the landfill has been delineated as an upland area (annual/ruderal upland complex). Executive Order 11990 is therefore not considered an ARAR or a TBC for the site. However, because jurisdictional wetlands, including “salt marsh” and “seasonal brackish/salt marsh mosaic” habitats, exist immediately adjacent to the boundaries of the Tidal Area Landfill, appropriate precautions will be taken to ensure these wetlands are not impacted. (WESCO 1995)

Clean Water Act,(33 USC § 1344): Section 404 of the Clean Water Act of 1977 governs discharge of dredged and fill material into waters of the United States, including adjacent wetlands. Wetlands are areas that are inundated by water frequently enough to support vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows river overflows, mudflats, natural ponds and similar areas. Both the EPA and the U.S. Army Corps of Engineers have jurisdiction over wetlands. EPA’s Section 404 guidelines are promulgated in 40 CFR § 230, and the U.S. Army Corps of Engineer’s guidelines are promulgated in 33 CFR § 320.

Discharge of dredge or fill material to a wetland is not planned as part of the response action. Therefore, Section 404 is not an ARAR or a TBC. However, because the landfill is located adjacent to wetlands, precautions will be taken to ensure there are no impacts to wetlands.

Coastal Resources ARARs

Federal

Coastal Zone Management Act: The Coastal Zone Management Act (CZMA) (16 USC §§ 1451-1464) and the accompanying implementing regulations in 15 CFR § 930 require that federal agencies conducting or supporting activities directly affecting the coastal zone conduct or support those activities in a manner that is consistent with the approved state coastal zone management programs. A state coastal zone management program (developed under state law and guided by the CZMA) sets forth objectives, policies,

and standards to guide public and private use of lands and water in the coastal zone. California's approved coastal management program includes the San Francisco Bay Plan (Bay Plan) developed by the BCDC. The BCDC was formed under the authority of the McAteer-Petris Act, California Government Code § 66600 *et seq.*, which authorizes the BCDC to regulate activities within San Francisco Bay and the shoreline (100 feet landward from the shoreline) in conformity with the policies of the Bay Plan. The McAteer-Petris Act and the Bay Plan were developed primarily to halt uncontrolled development and filling of the Bay. Their broad goals include reducing Bay fill and disposal of dredged material in the Bay, maintaining marshes and mudflats to the fullest extent possible to conserve wildlife and abate pollution, and protecting the beneficial uses of the Bay. The Coastal Zone Management Act is relevant and appropriate and is, therefore, an ARAR.

State

McAteer-Petris Act of 1965: California's approved coastal management program also includes the Bay Plan developed by the BCDC. Its broad goals are discussed above. The McAteer-Petris Act is relevant and appropriate and is, therefore, an ARAR.

Cultural Resources and Other ARARs

The landfill does not encompass any historic properties included or eligible for inclusion on the National Register. No scientific, prehistoric, or archeological data have been identified at Site 1. Therefore, no cultural resource ARARs have been identified as pertinent to Site 1.

EPA and the Navy have determined that the requirements of NEPA and CEQA are no more stringent than the requirements for environmental review under CERCLA and the NCP. Hence, NEPA and CEQA are not considered ARARs for CERCLA actions.

2.8.1.4 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities. These requirements are triggered by the particular remedial activities conducted at the site and suggest how a selected remedial alternative should be achieved. These action-specific requirements do not in themselves determine the remedial alternative; rather, they indicate how a selected alternative must be conducted.

The main ARARs pertinent to the alternatives are landfill regulations. Summarized below are the Navy's conclusions as to the controlling ARARs for landfill closure and groundwater monitoring. State action-specific ARARS are summarized in Table 4.

Based on available historical information, the Tidal Area Landfill received household garbage and municipal waste from the Naval Weapons Station, ships, and surrounding civilian communities. The results for groundwater samples collected over a period of 9 years indicate that no hazardous substances or hazardous wastes are migrating from the landfill. This information supports the Navy's finding that wastes disposed of at the Tidal Area Landfill are consistent with landfills that fall under EPA's presumptive remedy guidance for municipal landfills. Although some of the wastes discarded at the landfill may have contained hazardous constituents, this circumstance is common to all municipal landfills. Therefore, Site 1 is considered a solid waste landfill, and is not subject to federal or California hazardous waste regulations for landfills (40 CFR § 264 and Title 22 CCR). State requirements in Title 23 CCR Chapter 15 pertaining to capping units that received hazardous waste are not ARARs for the same reasons.

Federal requirements for municipal solid waste landfills generally are not applicable to the Tidal Area Landfill because Site 1 was not active after the effective date of federal regulations codified at 40 CFR § 258. Similarly, the solid waste disposal requirements of Title 27 of the California Code of Regulations, Division 2 are not applicable because the Tidal Area Landfill became inactive prior to the effective date of the regulations because it no longer received waste after November 27, 1984. However, because the Tidal Area Landfill was not completely closed at the time it became inactive, many of the closure and post-closure maintenance standards of Title 27, Division 2, Subdivision 1, Chapter 3, Subchapter 5 are ARARs for this remedial action.

Pursuant to the state's efforts to consolidate and simplify its environmental programs, SWRCB and CIWMB have consolidated the solid waste regulations into Title 27 CCR, Division 2. These regulations became effective in July 1997. Until that date, two different sets of solid waste regulations existed in the State of California: SWRCB's regulations in Title 23, and CIWMB's regulations in Title 14. Title 27, Division 2 regulations continue to distinguish between regulations adopted by CIWMB and SWRCB. Therefore, the ARAR analysis considered both SWRCB and CIWMB regulations.

Title 27 CCR, Division 2, § 20950 sets forth general standards for closure of all solid waste management units, including performance goals for closing such units. Section 21090 establishes final cover

requirements of SWRCB, including a prescriptive, multilayer cap design. Section 20310 and 20320 set forth general construction and containment criteria. The Navy has determined that the substantive standards of these requirements are relevant and appropriate to closure of the Tidal Area Landfill. However, 27 CCR § 20080 and § 20090 allow for engineered alternatives and exemptions from the prescriptive standards of Title 27, Division 2, provided that the alternative affords equivalent protection against water quality impairment and provided that the remedy is taken by a public agency. RWQCB staff has indicated that it will support the Navy's proposed remedy using a native soil cover provided that no potential harm to ecological receptors is determined from landfill leachate. Thus, 27 CCR § 20080 and §20090 are also ARARs for the capping alternatives.

In addition, CIWMB regulations in Title 27, Division 2 are applicable for closure of landfills that did not complete closure pursuant to regulations in effect at the time waste was last received (27 CCR §§ 21099 and 21100(b)). CIWMB requirements for closed sites appear at 27 CCR §§ 21100 et seq. In particular, CIWMB closure and post-closure maintenance requirements are specified at 27 CCR §§ 21140(a)(b), 21142(a), 21145(a), and 21150(a) and (b). These four sections provide narrative standards that duplicate many of the requirements discussed above from 27 CCR § 21090. These narrative standards are:

- function with minimum maintenance;
- provide waste containment to protect public health and safety;
- achieve compatibility with post-closure land use; and
- provide equivalent protection from wind and water erosion as an erosion layer that contains a minimum of 6 inches of earthen material that is capable of sustaining native plant growth.

Qualitative CIWMB requirements for final grading, slope stability, and drainage and erosion control are discussed in §§ 21142, 21145, and 21150. Substantive portions of these requirements are applicable to the cap construction and are listed in Table 4.

In addition, this ROD identifies certain SWRCB groundwater monitoring requirements of Title 27, Division 2 as ARARs for the capping alternatives. Though the Tidal Area Landfill no longer received waste by the effective date of SWRCB regulations now codified in Title 27, Division 2 (November 27, 1984), under § 20080(g), the party responsible for the unit may be required by the RWQCB to institute a detection

monitoring program in accordance with these regulations. The RWQCB has requested that the Navy implement a detection monitoring program to ensure that no releases from the landfill impair water quality in the vicinity of the landfill. The substantive requirements of 27 CCR §§ 20385, 20400, 20405, 20415, 20420, 20425 and 20430, as listed in Table 4, have been identified as ARARs for the detection monitoring component of the alternatives discussed below.

Similarly, the Navy has determined that the Title 27, Division 2 requirements for a landfill gas monitoring program, as described in section 2.8.1.2, are applicable to capping alternatives. Title 27 CCR §§ 20921, 20923, 20925, 20932, 20933, and 21160 require construction and operation of a perimeter landfill gas monitoring network. Title 27 CCR § 20918 allows for exemptions from the landfill gas monitoring requirement based on a showing that there is no potential or adverse impacts on public health and safety and the environment. These sections are listed in Table 4 and have identified as ARARS.

2.8.2 Alternative 1: No Action

Under the no action alternative, no remedial actions will be implemented other than conducting groundwater and landfill gas monitoring. Groundwater and landfill gas monitoring are discussed below.

2.8.2.1 Groundwater Monitoring

The groundwater detection monitoring program would be developed in accordance with the monitoring regulations of 27 CCR, Division 2, Subdivision 1, Chapter 3, Subchapter 3, which have been identified as applicable to final closure of the landfill. The groundwater monitoring program would be described in an appropriate remedial design document. Currently, seven groundwater monitoring wells are located around the perimeter of Tidal Area Landfill (locations of the wells are illustrated on Figure 3). Sufficient monitoring wells exist to establish background concentrations for groundwater. Additional monitoring wells may be constructed, if necessary, to enhance early detection of releases from the landfill and to assess water quality at points of compliance. Under this alternative, all monitoring wells would be sampled and analyzed semi-annually for 5 years. The Navy would derive and propose concentration limits for each constituent of concern as part of the long-term groundwater monitoring program. Samples would be collected for analysis of metals, total dissolved solids, and total suspended solids only based on the rationale presented in the Confirmation Groundwater Sampling study (TtEMI 1998a). If the monitoring program confirms that chemical concentrations exceed limits for constituents of concern, the Navy would immediately notify the regulatory agencies and would evaluate groundwater contamination in accordance

with CERCLA. The cost analysis completed for the FS, and used in this ROD, is based on a 30-year monitoring program. The need for continued monitoring would be evaluated after 5 years of initial monitoring.

2.8.2.2 Landfill Gas Monitoring

Under this alternative, landfill gas monitoring wells would be completed around the perimeter of the Tidal Area Landfill in accordance with the applicable requirements in 27 CCR Division 2, Chapter 3, Subchapter 4, Article 6. The required spacing of up to 1,000 feet apart would be satisfied with the installation of four new wells. The exact placement of these wells would be decided during the remedial design. The landfill gas monitoring wells would be screened at various depths throughout the vadose zone to a maximum depth set by the bottom of refuse, with probes installed above the permanent low seasonal water table.

Concentrations of methane around the landfill perimeter would be monitored for 3 years and evaluated against the lower explosive limit (concentration of 5 percent by volume in air). The need for continued monitoring would be re-evaluated based on the results of the first 3 years of landfill gas monitoring.

2.8.3 Alternative 2: Containment, Native Soil Cap, Institutional Controls, and Groundwater and Landfill Gas Monitoring

Alternative 2 containment involves the following actions:

- Groundwater monitoring
- Landfill gas monitoring
- Implementation of institutional controls
- Installation of a native soil cap
- Site grading and revegetation
- Operation and maintenance

Section 2.8.2 addressed groundwater and landfill gas monitoring. Therefore, institutional controls and the native soil cap (including site grading and revegetation) are the only components of Alternative 2 described below. Figure 4 is a conceptual diagram of Alternative 2.

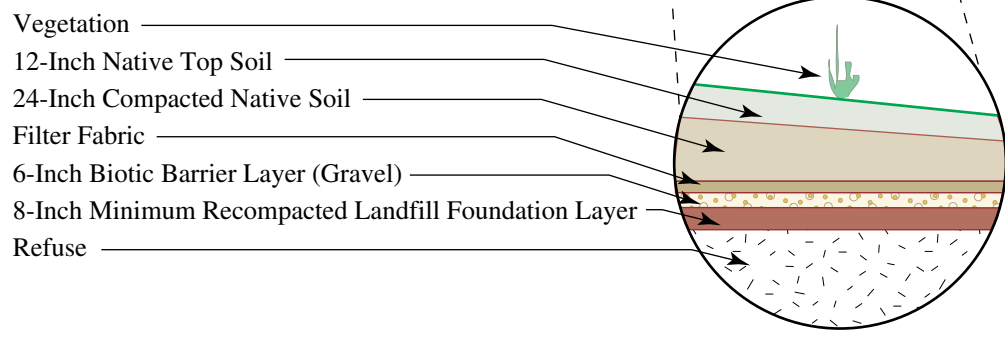
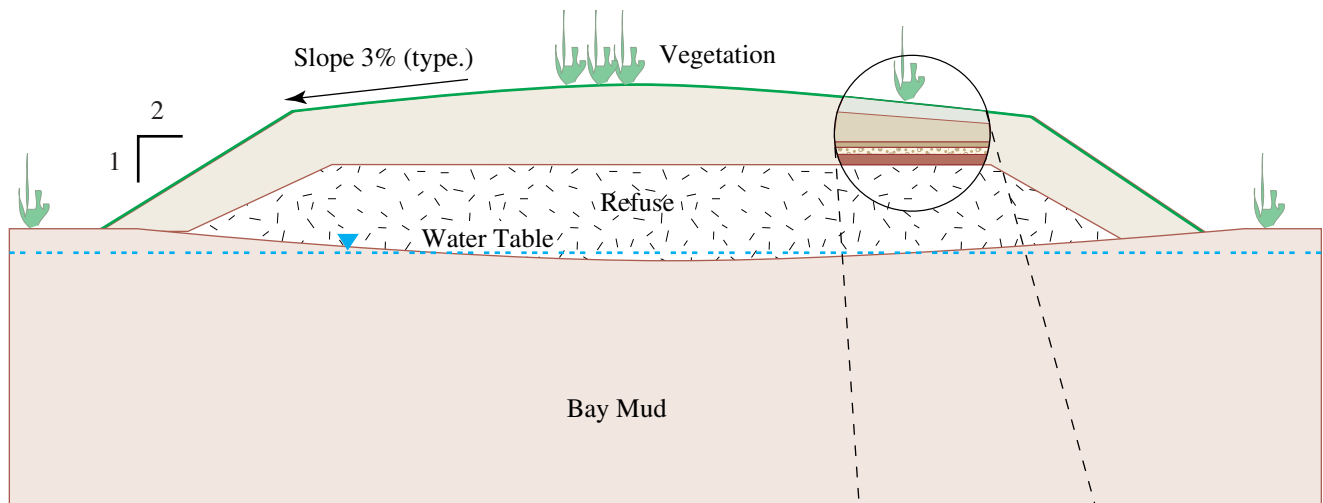
2.8.3.1 Institutional Controls

Institutional controls would be implemented as part of Alternative 2 to safeguard the integrity of the native soil cap and associated monitoring systems. Institutional controls are legal mechanisms for restricting access or exposure to contaminants. The NCP recognizes that institutional controls may be necessary to supplement and protect engineering controls in preventing exposure of humans and the environment when waste is left in place. In addition, EPA has identified institutional controls as part of the containment presumptive remedy. Institutional controls would be selected as a component of this remedial action to maintain effectiveness of the selected containment alternative in preventing exposure to debris and contaminated soil and groundwater within the landfill. In particular, these controls are intended to protect the integrity of the soil cover and prevent use of groundwater at Site 1.

Institutional controls are required to protect the landfill remedy by (1) preventing excavation or physical alternation of the landfill cap, (2) preventing unacceptable risk to human health caused by excavation of contaminated materials from the landfill, (3) preventing use of water that presents an unacceptable risk to human health, (4) protecting groundwater monitoring equipment, and (5) preserving access to the site and associated monitoring equipment. Institutional controls would prohibit the following activities at the landfill:

- (a) Construction of facilities, structures, appurtenances, or any other land-disturbing activity into or onto the surface of the landfill that may affect the drainage or increase erosion, including any activity that will damage the cover or affect the drainage and erosion controls developed to protect the cover – Excavations into the landfill would generally be prohibited except as necessary to maintain or repair the landfill cover.
- (b) Planting deep-rooted plants that could threaten the integrity of the landfill cap
- (c) Land-disturbing activity on lands adjacent to the landfill that may cause adverse effects on the landfill through erosion of the surface or diversion of off-site surface water onto the landfill
- (d) Removal of, tampering with, or damage to security features (for example, locks on monitoring wells)
- (e) Irrigation of the landfill surface unless for the purpose of establishing the vegetative layer
- (f) Construction of any buildings for human habitation

In addition, warning signs would be posted to advise against intrusive activities that could compromise the integrity of the cap.



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FIGURE 4
CONCEPTUAL DIAGRAM OF ALTERNATIVE 2
NATIVE SOIL CAP
TIDAL AREA LANDFILL

The Navy would implement these institutional controls through a notation in the IMP or its equivalent planning document. Institutional controls would also be filed with the installation office responsible for maintaining buildings and grounds. The IMP or its equivalent would be amended to indicate that future construction activities, agricultural, commercial, or residential land use at the Tidal Area Landfill, and groundwater extraction for agricultural, industrial, or residential uses are prohibited at the landfill. Should the Navy propose to change land use at the Tidal Area landfill in the future, the Navy would provide advance notice to the regulatory agencies. The Navy would also evaluate whether the anticipated land use change will pose unacceptable risks to human health and the environment or impair the effectiveness of the remedy, and whether any additional remedial action should be undertaken. Any additional action deemed necessary will be undertaken in accordance with CERCLA.

In addition, the Navy would develop a land use control implementation plan (LUCIP) for the institutional controls. The LUCIP would be incorporated into the IMP or its equivalent and would explain how institutional controls would be established, documented, maintained, and managed. The LUCIP would describe the boundaries of the site, the objectives of the institutional controls, the restrictions, the specific mechanisms to be implemented or already implemented, the required frequency for inspections, the entities responsible for carrying out the monitoring and inspection, the methods for certifying compliance with institutional controls after inspections have been completed, and procedures for notifying the Regional Water Quality Control Board (RWQCB) and EPA in the event of a failure to comply with the restrictions. The LUCIP would be developed as part of the post-closure maintenance and monitoring plan and would be provided to the regulatory agencies for review and comment.

2.8.3.2 Native Soil Cap

A native soil cap would be implemented under this alternative to isolate refuse; eliminate direct contact with surface soil; and reduce erosion, infiltration, and surface contaminant migration at the landfill (Figure 4). The native soil cap would rest on a foundation layer that would consist of the compacted and regraded surface of the existing landfill. Although an imported layer of soil is not proposed as a foundation layer in the cap design, grading of the existing landfill surface would be significant to achieve the required drainage slopes over much of the landfill area. The proposed cap will cover the entire extent of the existing landfill. In order to do so, existing refuse and fill material at the perimeter of the landfill will be stripped from the area and replaced as compacted foundation materials for cap support in the interior portions of the landfill.

Excavation of the landfill perimeter is expected to provide the following advantages over alternative treatments:

1. The existing landfill perimeter soil will be consolidated to a smaller area.
2. The proposed cap can be sealed to the underlying, relatively impermeable, Bay Mud soil.
3. The relocated fill soil and waste will be placed as a compacted fill to provide foundation for the native soil cap.
4. No additional marsh area in Site 2 will be disturbed as a result of the proposed work.

The native soil cap would consist of a 2-foot-thick layer of compacted native clay or sandy clay soil. The native soil layer would be designed and constructed for an in-place permeability of no greater than 1×10^{-5} centimeters per second. A 1-foot-thick layer of native clay or sandy clay topsoil would overlie the 2-foot-thick compacted native soil cap. The 1-foot-thick layer of the native clay or sandy clay topsoil would enable full development of local vegetation throughout the root zone, based on the characterization of the Tidal Area habitat (Western Ecological Services Company Inc. [WESCO] 1995). The selected vegetation will be low-maintenance and drought tolerant.

The cap would be sloped so rainwater would drain off to the west side of the landfill and to a perimeter ditch on the east side of the site. Because the landfill is expected to settle under its own weight and under the weight of the new cap; the final surface of the cap would be designed to accommodate the anticipated settlement. The final capped surface of the landfill would be designed using a minimum post-settlement slope of 3 percent. The minimum 3 percent slope promotes the drainage of surface water from the cap and prevents surface water ponding. The cap would be designed to minimize erosion, thereby reducing the potential for surface migration of contaminants. The native soil cap would also limit infiltration into the landfill and reduce formation of leachate by promoting growth of vegetation, evapotranspiration, and surface water runoff. A biotic barrier layer consisting of gravel would also be installed to minimize uptake by plant roots of chemicals and prevent burrowing animals from encountering refuse. A filter fabric would be placed on top of the biotic layer to discourage root penetration and limit migration of fine soil into the gravel layer. Additionally, the cap would be tied into the existing Bay Mud along the perimeter of the landfill. This construction would serve as an additional landfill gas control mechanism by limiting lateral and vertical migration of gas through the cap and low-permeability Bay Mud.

As part of the cap design process, the Navy would conduct a landfill gas survey in accordance with the regulatory requirements of California's Health and Safety Section (HSC) Section 41805.5 to evaluate whether any landfill gas control (active or passive venting or oxidation) system is necessary to protect human health and the environment. If concentrations of gas detected during the survey exceed the requirements in 27 § 20921(a)(2), then the Navy would design and construct a landfill gas control system in consultation the CIWMB.

Surface controls would be implemented in conjunction with the native soil cap to minimize erosion. Surface drainage and erosion control technologies channel and direct site runoff. Surface drainage and erosion controls that would be used at the Tidal Area Landfill include surface grading and revegetation. Perimeter slopes at the edge of the landfill would not exceed an inclination of 2 horizontal to 1 vertical.

Operation and maintenance (O&M) is a necessary part of Alternative 2. A post-closure maintenance plan would be developed during the detailed remedial design phase and would include the following inspection schedules:

- A schedule for periodically inspecting the integrity of the native soil cap. Inspections would be directed toward identifying potential erosion areas or breaches in the layer and areas of nonuniform settlement that result or would result in ponding of surface water.
- A schedule for periodically inspecting the vegetative cover to identify stressed or failed areas.

In addition to the above schedules, a schedule for fertilization, and replanting will be included in the maintenance plan if these elements are necessary for the early success of the vegetative cover. Criteria to measure the success of the vegetative cover would be included in the remedial design.

2.8.4 Alternative 3: Containment, Multilayer Cap

Alternative 3 involves the following actions:

- Groundwater monitoring
- Landfill gas monitoring
- Implementation of institutional controls

- Installation of a multilayer cap
- Surface controls (site grading and revegetation)
- O&M

This alternative is similar to Alternative 2 except that it includes a low-permeability barrier layer as part of the cap design. A low-permeability layer would be included because it may offer enhanced resistance to infiltration and potentially result in less leachate generation. Other layers associated with multilayer caps include a vegetative layer, a biotic barrier and drainage layer, and a foundation layer. These layers function mainly to protect the integrity and function of the low-permeability barrier layer.

Grading for Alternative 3 would be conducted as described for Alternative 2 where the landfill perimeter refuse and fill soil would be excavated and relocated to a more central area of the site. The advantages for Alternative 3 are the same as those previously described in Alternative 2.

Sections 2.8.2 and 2.8.3 previously addressed groundwater and landfill gas monitoring, institutional controls, and surface controls. Therefore, the multilayer cap is the only component of Alternative 3 described below.

Multilayer Cap

A multilayer cap would be implemented under this alternative to isolate refuse, eliminate direct contact with surface soil, reduce erosion, reduce surface migration of contaminants, and limit infiltration. The main action-specific ARARs associated with design and construction of the multilayer cap are in 27 CCR Division 2, Chapter 3, Subchapter 5. The multilayer cap is a prescribed final landfill cover as specified in Title 27 CCR, Section 21090. The principal differences between the multilayer and native soil cap are the lower hydraulic conductivity of the multilayer cap (reduced water infiltration) and significantly higher cost. The multilayer cap meets or exceeds the performance standards and minimum design requirements for a final landfill cover system of SWRCB at Title 27 CCR, Division 2, Sections 20950(a)(2) and 21090, and of CIWMB at Title 27 CCR, Division 2, Section 21140. The multilayer cap includes a low-permeability layer (or barrier layer) of material in the cap, typically consisting of compacted clay or a geosynthetic clay liner. The other layers mainly serve to protect this low-permeability layer and maintain its function.

The sequence of layers in a typical multilayer cap consists of, from bottom to top, the foundation layer, low-permeability barrier layer, biotic barrier and drainage layer, and vegetative (surface soil) layer (Figure 4). A foundation layer of soil (Title 27 CCR § 21090[a][1]) is placed over the refuse, typically consisting of native soil and recycled or reused waste materials to support the barrier layer and provide a foundation for its construction.

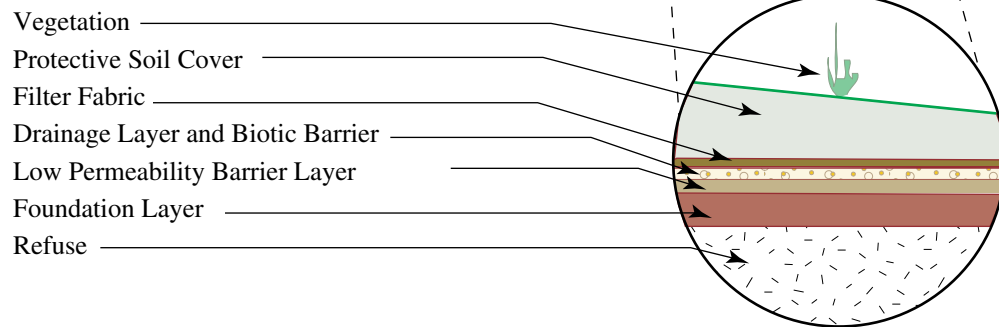
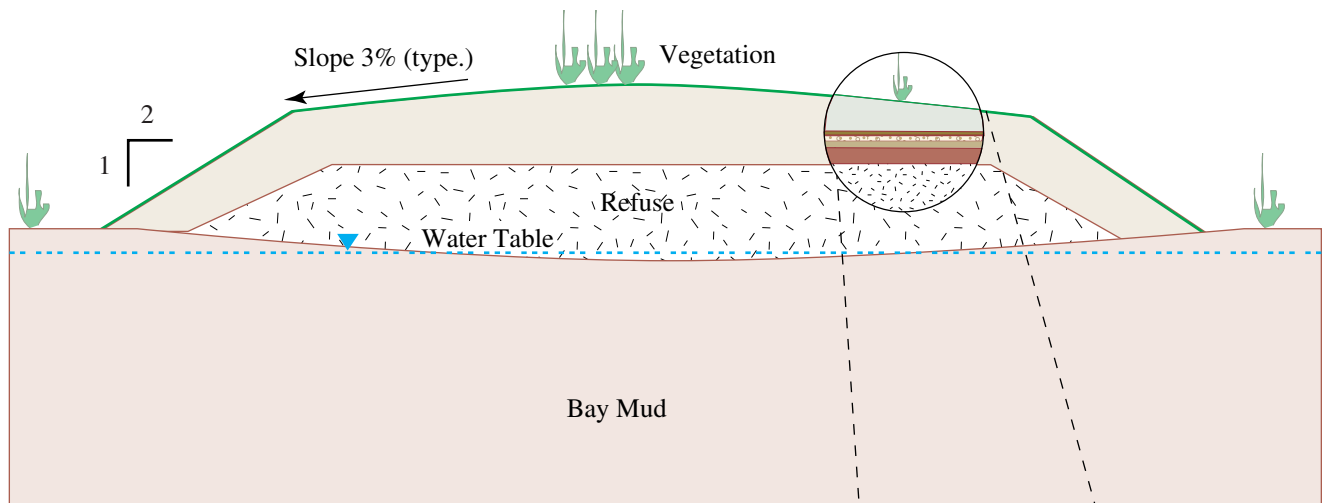
The low-permeability barrier layer is placed above a 2-foot-thick foundation layer constructed in accordance with 27 CCR § 21090(a)(2). The barrier layer would be designed during the remedial design phase and would comply with the minimum permeability requirement of 1×10^{-6}

centimeters per second (one foot per year). Unless the low-permeability barrier layer is designed using geosynthetic materials, it will be designed to be at least 1 foot thick.

A biotic barrier and drainage layer would be placed above the barrier layer. The biotic barrier layer consisting of gravel would prevent plant roots and burrowing animals from penetrating and impairing the integrity of the low-permeability layer. The biotic barrier would be covered with a filter fabric to prevent migration of the cover soil into the biotic barrier. The drainage layer would reduce the hydraulic head on top of and transport water away from the low-permeability layer, therefore, limiting the driving force for vertical migration.

Lastly, the surface soil layer, typically consisting of native soil, supports vegetation and is typically at least 12 inches thick (27 CCR § 21090[a][3]). The thickness of the vegetative layer in Alternative 3 would be specified during the remedial design phase to allow for the full development of plant root systems. This surface layer would be constructed to encourage drainage of rainwater, consistent with the minimum post-settlement 3 percent slope specified in Title 27 CCR Section 21090(b). Post-closure requirements will be followed as specified in Title 27 CCR Section 21090(c). This layer mainly functions to protect the biotic barrier layer by reducing erosion and desiccation. Figure 5 is a conceptual diagram of Alternative 3.

Similar to Alternative 2, the location of the landfill warrants consideration of several location-specific ARARs and to-be-considered (TBCs) regulations when designing the multilayer cap. Specifically, requirements pertaining to floodplains, wetlands, threatened and endangered species, and coastal zone would be addressed in designing the cap. Section 2.11.2.2 discusses these location-specific ARARs and TBC regulations in detail.



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FIGURE 5
CONCEPTUAL DIAGRAM OF ALTERNATIVE 3
MULTI LAYER CAP
TIDAL AREA LANDFILL

In addition, the substantive groundwater detection monitoring requirements of 27 CCR, Division 2, Subdivision 1, Chapter 3, Subchapter 3 are applicable and would be complied with under this alternative. Similarly, landfill gas closure and post-closure monitoring and control requirements of 27 CCR, Division 2, §§ 20921, 20923, 20925, 20932, 20933, and 21160 are applicable and would be complied with under the proposed landfill gas monitoring program for Alternative 3. Section 2.11.2.3 discusses these action-specific ARARs in detail.

2.9 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This section analyzes the advantages and disadvantages of each of the three alternatives described in Section 2.8. The alternatives were evaluated based on the following nine criteria, as required by Section 300.430(e) of the NCP:

- Overall protection of human health and the environment
- Compliance with ARARs and TBC regulations
- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

The comparative analysis of the three alternatives with respect to these nine criteria is described below.

2.9.1 Overall Protection of Human Health and the Environment

This criterion assesses whether each alternative adequately protects human health and the environment. The overall assessment of protection is based on an evaluation of long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. The evaluation of protectiveness focuses on how site risks are reduced or eliminated by each alternative. Risk reductions are associated

with how effectively an alternative meets the RAOs. This criterion is considered a threshold criterion that must be met by the selected alternative.

Alternative 1 does not meet the threshold criteria of overall protection of human health and the environment because refuse would not be contained and isolated. If no action is taken, conditions at the site will be unpredictable and uncontrolled, leaving open the possibility for future erosion and exposure to human and ecological receptors. Leaving the site uncontrolled would not likely provide continual overall protectiveness from hazards.

Alternatives 2 and 3 are protective of human health and the environment. Both alternatives provide protection of human health and the environment by isolating the contaminants with a cap and protecting its integrity with supporting technologies and institutional controls. Both alternatives monitor groundwater and landfill gas migration. The comparative analysis of alternatives in the FS found that both would be similar in effectiveness at reducing leachate formation, but that Alternative 2 is slightly more effective in the long term based on concerns regarding settlement and slope stability for Alternative 3, as discussed in Section 2.9.3.

2.9.2 Compliance with ARARs

This evaluation criterion is used to evaluate whether each alternative will meet all of its identified federal and state ARARs. This criterion is also a threshold that must be met by the selected alternative.

ARARs are not applied to the no action alternative (Alternative 1) because no action would take place.

Alternatives 2 and 3 comply with all chemical-, location- and action-specific ARARs. Compliance with specific requirements is evaluated for the selected remedy in Section 2.11.2.

2.9.3 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of the alternatives in maintaining protection of human health and the environment. The primary focus of this evaluation is the extent and effectiveness of controls used to manage the risk posed by untreated wastes.

Alternatives 2 and 3 both provide long-term effectiveness and permanence for the landfill but will require occasional O&M. The function of the both capping alternatives is to isolate refuse, eliminate exposure to

surface soil, reduce erosion, and limit infiltration. The caps are highly effective in the long term because with proper O&M, they both will succeed in each of these functions. The primary differences between Alternatives 2 and 3 lie in their abilities to limit rainfall infiltration, in their long-term settlement behavior, and their potential for seismic displacement.

The main physical difference between the alternatives is that Alternative 3 employs a more complex multilayer cap instead of a single-layer native soil cap. The additional layers in Alternative 3 include low-permeability and drainage layers that reduce infiltration. To achieve this, the multilayer cap relies on a synthetic layer plus additional soil that drains water from and protects the synthetic materials. The additional layers result in a cap that is thicker and heavier than the Alternative 2 cap. These layers reduce infiltration, which in turn should reduce the amount of leachate formed. Reduction of leachate formation reduces the potential for leachate migration. Both the native soil cap and multilayer cap designs use evapotranspiration, soil storage capacity, and runoff processes to limit infiltration.

Alternative 2 also yields a substantial reduction in infiltration. Modeling results in Appendix E of the FS (TtEMI 1998b) showed that Alternative 2 is effective at shedding up to 79 to 85 percent of the annual rainfall as a result of drainage improvements and the relative impermeability of the native soil layer.

Although Alternative 3 is less permeable than Alternative 2 (about 15 to 21 percent less permeable), the native soil cap would be similar in overall effectiveness when compared with the multilayer cap. Under existing conditions, where the heavily pocketed landfill absorbs nearly 100 percent of rainfall, there is little evidence of contaminant plumes. The reduction in infiltration achieved by the native soil cap, if maintained, will be more than adequate to significantly reduce the potential for contaminated leachate migration, and thereby create permanent isolation of landfill contaminants and protection of the environment. Moreover, since the landfill last received waste in 1979, the potential for leachate formation is significantly less than it was 20 years ago. The native soil cap will be an effective precautionary measure to protect against leachate formation until that potential diminishes to zero.

The increased weight of the multilayer cap has undesirable long-term effects. The geotechnical analysis completed for the FS addressed settlement of the landfill and slope stability. The landfill is situated on highly compressible Bay Mud that is susceptible to significant settlement as a result of new loads. Because the multilayer cap is heavier than the native soil cap, the analysis showed that settlement from the weight of the multilayer cap would increase the volume of refuse below the water table, potentially

increasing leachate formation. Increased settlement also could increase the O&M efforts for the multilayer cap because of the additional disturbance created at the surface of the landfill.

The stability analysis consisted of a static evaluation and a preliminary seismic (earthquake) evaluation. For static conditions, both Alternatives 2 and 3 are considered stable. Nevertheless, if either of the alternatives were to show a tendency toward instability during earthquakes, the design with lower slopes and less overall height will be more stable. Because Alternative 2 relies on a lighter and thinner cap, it can be designed with lower slopes and to a lower height than Alternative 3. Although damage from earthquakes is considered unlikely for either alternative, the native cap is expected undergo less permanent deformation than the multilayer cap and would, therefore, require less repair, if any, after an earthquake. The results of the geotechnical analysis are shown in Appendix C of the FS.

Alternatives 2 and 3 both provide greater long-term effectiveness and permanence than Alternative 1. Over the long term, site conditions under Alternative 1 will be unpredictable and uncontrolled, although no groundwater contamination is evident despite nine years of groundwater monitoring. Nevertheless, Alternative 1 could result in future erosion and exposure to human and ecological receptors. Although both Alternatives 2 and 3 are judged effective over the long term, Alternative 2 is preferable because of its reduced weight and lower settlement potential. As a result, the FS ranks Alternative 2 slightly better for long-term effectiveness and permanence than Alternative 3.

2.9.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial actions that use treatment technologies to permanently reduce toxicity, mobility, or volume of hazardous substances.

None of the alternatives involve treatment to reduce toxicity, mobility, or volume of contaminants. Treatment options for refuse in a landfill are not considered because hot spots do not pose immediate and elevated threats to human health and the environment. Treatment of hot spots is impractical for landfills that present a low-level threat (EPA 1991). However, isolating refuse with a cap, and thereby reducing infiltration through the refuse, will help to reduce the likelihood that leachate will form and the mobility of contamination at the Tidal Area Landfill. Alternatives 2 and 3 are comparable in controlling the mobility and off-site migration of leachate. Through isolation of landfill refuse, Alternatives 2 and 3 are more

effective in reducing the mobility of contamination than Alternative 1. Alternative 1 does not reduce the mobility of contaminants.

2.9.5 Short-Term Effectiveness

Short-term effectiveness addresses the effects of each alternative during the construction and implementation phases until RAOs are met. The alternatives are evaluated with respect to the effects on human health and the environment during implementation of the alternative. Factors considered include the time to achieve RAOs and exposure to the community and the environment during construction.

Alternative 1 is effective in the short term because no remedial action will be implemented. There would be no impact to the surrounding community. Alternative 1 also provides short-term effectiveness because it minimizes impacts to existing ecological receptors at the Tidal Area Landfill.

Alternatives 2 and 3 both provide short-term effectiveness in reducing potential risk to the community during the construction and implementation phase through access restrictions. Potential exposure of workers to contaminants will be minimized by the use of personal protective equipment and ambient air monitoring.

As indicated in the RI report (PRC 1997), the Tidal Area supports some threatened and endangered plant and animal species. In the absence of an ecological survey of the landfill itself, the potential for some of these species to inhabit the Tidal Area Landfill exists. The Navy will consult with the U.S. Fish and Wildlife Service before the remedial action is undertaken to review the possibility of impacts to protected species during construction. Under Alternatives 2 and 3, heavy machinery and materials will be used to construct the proposed cap. However, impact on the adjacent wetland, if any, will be minimized through standard engineering controls and through consolidation along the perimeter of the landfill to allow for construction of the cap within the current boundaries of the landfill. Detrimental impact to existing habitats is expected to be short term, and no critical habitat is expected to be destroyed. It is reasonable to assume that the affected areas will recover in less than 5 years after the landfill has been capped based on recovery rates at sites with similar conditions (PRC 1997). In addition, revegetation efforts by the Navy will assist in accelerating the rate of recovery.

Under the short-term effectiveness criterion, alternatives were evaluated considering factors that included time to reach RAOs. Although both alternatives are expected to achieve RAOs relatively quickly (4 to 6

months), Alternative 3 will require more time to implement because larger volumes of material are required and installation will be more complex. Therefore, any exposure to the community under Alternative 3 is somewhat lengthier. Alternative 3 results in greater truck traffic and associated disturbances to the community are expected to be somewhat greater.

2.9.6 Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation.

Alternative 1 is easier to implement than Alternatives 2 and 3. Except for the monitoring wells, no construction is required. Monitoring is readily implementable.

For Alternatives 2 and 3, greater technical and administrative effort will be required than with Alternative 1 to construct the caps and surface controls and to establish institutional controls, including land use restrictions within the IMP or its equivalent planning document. The availability of material may be a greater concern when implementing Alternative 3 because of the multiple types required for construction of the cap. In addition, slopes needed to maintain the stability of the various layers might require more precontouring under Alternative 3 as compared with Alternative 2. Alternative 3 requires more than twice as much material to construct the multilayer cap as for the single-layer cap in Alternative 2. Installation of the geosynthetic clay liner layer as part of Alternative 3 will require specialized quality assurance/quality control procedures and specially trained construction personnel. However, both are readily available. Implementability of institutional controls is the same for Alternatives 2 and 3. Access restrictions for both alternatives will require minimal construction (fencing), and O&M will consist of groundwater monitoring, landfill gas monitoring, monitoring cap integrity, and cap maintenance.

2.9.7 Cost

The cost analysis for each alternative is calculated from estimates of capital and O&M costs. Capital costs consist of direct and indirect costs. Direct costs include the purchase of equipment, labor, and materials necessary to install the alternative. Indirect costs include engineering, financial, and other services such as testing and monitoring. Annual O&M costs for each alternative include operating labor, maintenance materials and labor, auxiliary materials, and energy.

Table 5 summarizes the costs for each alternative. The total net present value costs (including both capital and O&M costs) are \$2,833,000 and \$4,226,000, respectively. The majority of both estimated costs are associated with cap material and construction. For Alternative 3, capital costs associated with quality assurance/quality control testing required for placement of the barrier layer have been included. Annual O&M costs for the first five years, including groundwater monitoring, landfill gas monitoring, and cap maintenance, are estimated at \$75,000 for both. Estimated costs for construction of the monitoring systems, the land use and access restrictions, and the surface controls are identical for Alternatives 2 and 3. Total net present value costs (including capital costs and O&M costs) are higher for Alternative 3 than for Alternative 2.

The cost for Alternative 1 is lower than for Alternatives 2 and 3 because no remedial action would be implemented under Alternative 1. A detailed cost estimate for Alternative 2 is provided as Appendix B.

2.9.8 State Acceptance

Early in the RI/FS process, state and federal agencies supported the presumptive remedy process as evidenced by their approval of the RI work plans that included only limited sampling at Site 1, in accordance with the EPA's presumptive remedy guidance.

More recently, DTSC favored Alternatives 2 and 3 over Alternative 1. Considering infiltration rates, seismic stability, and settlement, DTSC supports the selection of Alternative 2. RWQCB supports the construction of Alternative 2 as evidenced by its comments on the Draft Final ROD. RWQCB also requested additional changes to the text and assurances from the Navy concerning the long-term protectiveness of the remedy. This version of the ROD has been updated with the changes requested by RWQCB.

State and federal agencies, including CalEPA, DTSC, the San Francisco Bay RWQCB, CIWMB, and the EPA have been involved in a long period of review, comment, and approval for investigation and remedy selection for the Tidal Area Landfill, Site 1. The process has spanned a period of more than 10 years and has included preparation all of the CERCLA documents associated with Site 1 and the surrounding IR sites.

The process has led to the preparation of this ROD, which state and federal agencies have also reviewed in detail. This document has been revised based on agency comment and requested modifications. As a

result of the long-term involvement and guidance by the state and federal agencies, the state accepts and supports this ROD. Signatures of state officials on this document evidence the state's acceptance of the ROD.

As is evident in the Responsiveness Summary (Appendix A), the community did not favor one alternative over another.

2.9.9 Results of the Comparative Analysis

Results of the comparative analysis indicate that Alternative 2 ranks the highest among the three alternatives. Alternative 2 is easier to implement, has comparable to slightly greater long-term and short-term effectiveness, and costs significantly less than Alternative 3. Alternative 3 incorporates additional layers to directly address infiltration; however, the increased layers yield no practical increase in effectiveness, while reducing implementability, and increasing costs significantly.

Alternative 2 is preferred over Alternative 1 even though Alternative 1 is the easiest to implement, has the lowest cost, and does not threaten current habitat. Alternative 2 eliminates exposures to human and ecological receptors by minimizing direct contact with refuse; diminishing infiltration; preventing inhalation of contaminated dust; and minimizing erosion and runoff through revegetation and grading. In addition, in-place containment of the contents of the landfill reduces the potential spread of contaminants off-site into the nearby wetlands. Alternative 1 achieves none of these results. The no-action alternative will leave these potential pathways intact and will provide little assurance against off-site contaminant migration. Erosion and runoff would continue to occur under Alternative 1, potentially spreading contaminants off site. In summary, Alternative 2 is recommended over Alternative 1 because it has superior long-term protectiveness, permanence and reduction in mobility of contaminants.

2.10 THE SELECTED REMEDY

The Navy has selected Alternative 2 (native soil cap, surface controls, institutional controls, groundwater and landfill gas monitoring, and maintenance) as the preferred alternative based on the analysis presented in the RI/FS reports.

The remedial action for the Tidal Area Landfill consists of the following:

- A native soil cap constructed to isolate landfill refuse, eliminate direct contact with surface soil, and reduce erosion, infiltration, and potential surface contaminant migration. Settlement monuments and warning signs to advise against intrusive activities that could compromise the integrity of the cap will be part of the cover.
- Institutional controls will be implemented as part of Alternative 2 to safeguard the integrity of the native soil cap and associated monitoring systems. Institutional controls would prohibit construction of any habitable structures, or other land-disturbing activity into or onto the surface of the landfill or adjacent to the landfill, planting vegetation that could threaten the integrity of the landfill cap, removal of or tampering with posted signs, irrigation of the surface of the landfill, and extracting groundwater from beneath the landfill. The Navy will implement institutional controls through a notation in the IMP or its equivalent planning document and will be filed with the installation office responsible for maintaining buildings and grounds. The Navy will develop a LUCIP as part of the post-closure maintenance and monitoring plan to ensure that institutional controls are maintained in the long term.
- Surface controls including ditches, if necessary, grading, and revegetation to eliminate direct contact with surface soil, and reduce erosion, infiltration, and surface contaminant migration.
- Monitoring groundwater and landfill gas on a regular basis to evaluate if potential contaminants within the landfill are migrating through the subsurface vadose zone or through groundwater to property surrounding the landfill.

This selected remedy fulfills the landfill refuse, groundwater, and landfill gas RAOs developed using EPA guidance documents (1991 and 1993). The native soil cap meets the RAO for landfill refuse of “protecting human and ecological receptors from exposure to landfill contamination by minimizing exposure pathways and contaminant migration.” The cap will isolate the wastes to eliminate direct contact of receptors to wastes and minimize leachate and landfill gas migration. The cap and groundwater monitoring program act together to meet the groundwater RAO of “protecting human and ecological receptors in the area from potentially harmful exposure resulting from leachate migration into groundwater and subsequently into surface water.” Although the cap minimizes formation of leachate, the groundwater monitoring program ensures that no contaminants are migrating off site. The native soil cap combined with the landfill gas monitoring and control program fulfills the RAO for landfill gas of “protecting human health and the environment from off-site subsurface methane gas migration.” The native soil cap will be constructed to tie into the existing Bay Mud along the perimeter of the landfill, thereby limiting lateral and vertical landfill gas migration through the cap and low-permeability Bay Mud. The connection of the cap to the Bay Mud, along with the landfill gas monitoring program, will ensure methane gas is not migrating off site.

The native soil cap will greatly reduce risks to human health and the environment and will eliminate direct contact of humans and animals to the contents of the landfill and will minimize erosion, formation of leachate, and migration of surface contaminants. Exposure limits will be reduced well below the EPA risk range for carcinogens, and hazard indices for noncarcinogens will be less than 1. In addition, implementation of Alternative 2, a native soil cap, will not pose unacceptable short-term risks or cross-media impacts.

However, as stated in Section 2.7.2, the Navy will notify the agencies in the event that the RI in Site 2 finds that pollutants, which may have migrated or are migrating from the landfill, pose an unacceptable risk to human health or ecological receptors. After the agencies have been notified, the Navy will evaluate the risk posed by releases of contaminants to Site 2. If appropriate, the Navy will conduct a feasibility study of potential remedial alternatives for Site 2 in accordance with the requirements of CERCLA.

The Net Present Value (NPV) of the total estimated cost associated with Alternative 2 is \$2,833,000. The present value was calculated based on a 7 percent discount rate over 30 years. The total capital cost for Alternative 2 is \$2,401,000. The annual O&M cost during the first 5 years is estimated to be \$75,000. Annual O&M cost assumes quarterly groundwater and landfill gas monitoring for the first 5 years and annual monitoring for the next 25 years. The total NPV cost includes capital costs and NPV of the annual O&M cost. A detailed cost estimate for Alternative 2 is presented in Appendix B.

The remedial design and construction phases may result in variations of the design parameters of the selected remedy. These alterations to the design parameters, in general, will reflect modifications resulting from the engineering design process.

2.11 STATUTORY DETERMINATIONS

Remedy selection is based on CERCLA, as amended by Superfund Amendments and Reauthorization Act, and the regulations contained in the NCP. All remedies must meet the threshold criteria established in the NCP. The selected remedy must also be cost effective and use permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces

volume, toxicity, or mobility of hazardous wastes as principal elements. The following sections discuss how the selected remedy meets these statutory requirements.

2.11.1 Overall Protection of Human Health and the Environment

The selected remedy, Alternative 2, is protective of human health and the environment. The combination of capping, institutional controls, and monitoring will meet all RAOs. Alternative 2 provides protection of human health and the environment by isolating the contaminants with a cap and protecting the integrity of the cap by monitoring, maintenance, and institutional controls. Alternative 2 includes groundwater and landfill gas monitoring and control requirements, if necessary. Alternative 2 also includes institutional controls to further limit exposure and protect human health.

The native soil cap will greatly reduce risks to human health and the environment, and will eliminate direct contact of humans and animals to the contents of the landfill and will minimize erosion, leachate formation, and surface contaminant migration. In addition, implementation of Alternative 2, the native soil cap, will not pose unacceptable short-term risks or cross-media impacts.

The proposed cap will fully contain all of the debris in the landfill so there is no anticipated human or animal exposure to materials in the landfill. In addition, there is no anticipated exposure to contaminated leachate. The intent of the cap is to fully prevent exposure to potentially toxic material. As long as the native soil cap is in place, is maintained, and is not otherwise disturbed, it is expected to fully prevent receptor contact. Without contact, the exposure pathway is considered broken, and no risk can be posed. As a result, the proposed remedy is expected to be fully protective of human health and the environment.

2.11.2 Compliance with ARARs

The selected remedy complies with ARARs. Each category of ARARs is discussed below.

2.11.2.1 Chemical-Specific ARARs

Chemical-specific ARARs do not exist for landfill refuse or soil.

Requirements for control of landfill gas at solid waste landfills under either Subtitle D of the Resource Conservation and Recovery Act (RCRA) (40 CFR § 258), or 27 CCR § 20921 *et seq.*) were considered ARARs. The Navy reviewed and compared both sets of requirements and determined that the standards

of Title 27 are more stringent than the Subtitle D standards. Therefore, the Navy is identifying the following standards of Title 27 as ARARs:

- Regulations adopted by CIWMB in § 20921(a)(2) require that landfill gas be monitored to ensure that methane gas concentrations at site boundaries do not exceed the lower explosive limit (LEL) for methane (5 percent methane by volume).
- Section 20921(a)(3) requires that trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic or carcinogenic compounds.

The landfill will be monitored quarterly for 3 years to ensure that these standards are achieved.

In addition, the San Francisco Bay Area Air Quality Management District (BAAQMD) regulates air emissions from landfills in Regulation 8, Rule 34. The rule limits emissions of organic compounds and methane from solid waste disposal sites. The Navy, however, has determined that Site 1 is exempt from this regulation because it does not meet the minimum volume requirement of 1 million tons of waste.

Table 1 summarizes chemical-specific ARARs for Alternative 2.

2.11.2.2 Location-Specific ARARs

Location-specific ARARs for the selected remedy are summarized in this section and on Table 2, for federal location specific ARARs and on Table 3 for state location specific ARARs. Biological resources, floodplain management, and coastal resources are the resource categories relating to location-specific requirements potentially affected by the Site 1 response actions.

Biological Resources ARARs

Substantive requirements of the federal Endangered Species Act of 1973 (16 United States Code [USC] § 1531, *et seq.*) and the California Fish and Game Code (FGC) (FGC §§ 2080, 3005, 3511, and 5650(a) and (b)) were included as ARARs because threatened and endangered species, migratory nongame birds, and mammals occur in the Tidal Area. No endangered, threatened, or otherwise protected species are known to inhabit the surface of the landfill. However, threatened and endangered species, including the salt marsh harvest mouse, may inhabit areas near the landfill, so precautions will be taken to ensure that the remedial action does not adversely affect any threatened or endangered species. Because Site 1 is not critical habitat and threatened or endangered species are not known to depend on it, actions taken under

Alternative 2 are not likely to appreciably reduce the likelihood of the survival and recovery of any endangered species.

Nevertheless, the landfill cap will protect these habitats by controlling erosion and washout that could otherwise accelerate migration of contaminants from the Tidal Area Landfill. The landfill cap will eliminate exposure pathways that result from erosion of the landfill surface and will reduce generation of leachate by reducing infiltration. In constructing the landfill cap and associated monitoring systems, the Navy will exercise precautions to avoid taking endangered species, mammals, migratory nongame birds, and other birds protected under State of California and federal laws.

Wetlands Protection and Floodplains Management ARARs

Neither Executive Order No. 11990, Wetlands Protection, nor Section 404 were identified as TBC regulations or ARARs, respectively, because jurisdictional wetlands do not exist within the Tidal Area Landfill; the landfill has been delineated as an upland area (annual/ruderal upland complex). However, jurisdictional wetlands, including “salt marsh” and “seasonal brackish/salt marsh mosaic” habitats, exist immediately adjacent to the boundaries of the Tidal Area Landfill (WESCO 1995). Proposed actions under Alternative 2 would not affect wetlands. The cap construction proposed will be near wetlands, so engineering practices commonly used to reduce the potential impact to wetlands, including those listed below, will be in place:

- Sensitivity training for subcontractors working on the site
- Construction of temporary silt collection fences around the landfill perimeter to control sediment and surface water migration into the wetland during construction of the cap
- Stockpiling of soil away from the boundaries of the wetland
- Conducting construction during the dry season to minimize runoff

However, should any impact to wetlands be anticipated during the remedial design/remedial action phases, the Navy will comply with the substantive requirements of Executive Order 11990 and Section 404 of the Clean Water Act. In particular, the following contingency actions would be taken:

- Notify the U.S. Army Corps of Engineers and the Natural Resource Trustees.
- Restore wetland to preconstruction condition.

Additionally, refuse from the western perimeter of the landfill will be removed and consolidated within the landfill before construction of the cap begins. The waste will be consolidated in a manner that will prevent or minimize disturbance to wetlands through the use of engineering controls listed above. Proposed actions under Alternative 2 will not affect adjacent wetlands in the Tidal Area. The landfill cap will protect the adjacent wetlands by reducing erosion and washout that could cause contaminant migration.

Executive Order 11988, Flood Plain Management

Under 40 CFR § 6.302(b), federal agencies are required to evaluate the potential effects of action they may take in a floodplain to avoid, to the extent possible, adverse effect associated with direct and indirect development of a floodplain. The cap will be installed to allow surface flow across the landfill toward the wetland in an evenly distributed pattern. Erosion will be minimized. With these actions, the selected remedy will not adversely affect the flood plain or be incompatible with flood plain development. Therefore, the remedy complies with this TBC.

Coastal Area ARARs

Section 307(c)(1) of the Coastal Zone Management Act (CZMA, 16 USC § 1456(c)1), and the implementing regulations in 15 CFR §§ 930 and 923.45, require that all federal activities that affect land or water uses of the coastal zone be conducted in a manner consistent, to the maximum extent practicable, with approved state management programs. A state coastal zone management program (developed under state law and guided by the CZMA) sets forth objectives, policies, and standards to guide public and private uses of lands and water in the coastal zone. California's approved coastal management program includes the BCDC Bay Plan; its broad goals include reducing Bay fill and disposal of dredged material in the Bay, maintaining marshes and mudflats to the fullest extent possible to conserve wildlife and abate pollution, and protecting the beneficial uses of the Bay. Alternative 2 will be implemented consistently with this goal and will conform to the substantive requirements of the state management program. The landfill cap will protect the adjacent coastal zone by reducing erosion and washout from the Tidal Area Landfill. The monitoring programs for groundwater and landfill gas proposed under Alternative 2 will assist in maintaining the existing overall quality of the coastal zone.

2.11.2.3 Action-Specific ARARs

As described in Section 2.8.1.3, Site 1 is considered a solid waste landfill, and is not subject to federal or California hazardous waste regulations for landfills (40 CFR § 264 and Title 22 CCR) or the state's Title 23 CCR Chapter 15 regulations pertaining to capping units that received hazardous waste. Further, the federal and state requirements for municipal solid waste landfills codified at 40 CFR § 258 and Title 27 of the California Code of Regulations, respectively, are not applicable because the landfill was not active at the time these regulations became effective. However, because the Tidal Area Landfill was not completely closed at the time it became inactive, many of the closure and post-closure maintenance standards of Title 27, Division 2, Subdivision 1, Chapter 3, Subchapter 5 are ARARs for this remedial action.

Title 27 CCR, Division 2, § 20950 sets forth general standards for closure of all solid waste management units, including performance goals for closing such units. Section 21090 establishes final cover requirements of SWRCB, including a prescriptive, multilayer cap design. The Navy has determined that the substantive standards of these requirements are relevant and appropriate to closure of the Tidal Area Landfill. Title 27 CCR § 20080 and § 20090, which allow for engineered alternatives and exemptions from the prescriptive standards of Title 27, Division 2 are also ARARs for the site. The native soil cap design of Alternative 2 will meet the requirements of an engineered alternative because it is consistent with performance standards (including minimizing infiltration of water into landfill waste) and affords protection against water quality impairment. Soil caps are used when limited hazardous substances are leaching from a landfill and minimal groundwater contamination exists. In addition, soil caps are appropriate if portions of the landfill are below the water table and lowering the water table is not practical (EPA 1991).

In addition, CIWMB regulations in Title 27, Division 2 are applicable for closure of landfills that did not complete closure pursuant to regulations in effect at the time waste was last received (27 CCR §§ 21099 and 21100(b)). Specifically, CIWMB closure and post-closure maintenance requirements specified at 27 CCR §§ 21140(a)(b), 21142(a), 21145(a), and 21150(a) and (b) are ARARs. These four sections contain requirements for final cover, grading, slope stability, and drainage and erosion control. Substantive portions of these requirements are applicable to the cap construction and are listed in Table 4.

In addition, this ROD identifies certain SWRCB groundwater monitoring requirements of Title 27, Division 2 as applicable for the selected remedy. Though the Tidal Area Landfill no longer received waste by the effective date of SWRCB regulations now codified in Title 27, Division 2 (November 27, 1984), under § 20080(g), the party responsible for the unit may be required by the RWQCB to institute a detection monitoring program in accordance with these regulations. The RWQCB has requested that the Navy implement a detection monitoring program to ensure that no releases from the landfill impair water quality in the vicinity of the landfill. Accordingly, the Navy will develop a detection monitoring program in accordance with the substantive requirements of 27 CCR §§ 20385, 20400, 20405, 20415 and 20420, as listed in Table 4. If the detection monitoring program confirms a measurably significant release from the landfill, the Navy will immediately notify the regulatory agencies and will evaluate groundwater contamination and possible remedial action in accordance with CERCLA. Since there is no evidence of a release of constituents of concern from the landfill despite 9 years of groundwater monitoring, the Navy has concluded that an evaluation monitoring program and a corrective action program are not relevant and appropriate.

Similarly, the Navy has determined that the Title 27, Division 2 requirements for a landfill gas monitoring program, as described in Section 2.8.1.2, are applicable for this alternative. A perimeter landfill gas monitoring network will be constructed and operated in accordance with the substantive requirements of 27 CCR §§ 20921, 20923, 20925, 20932, 20933, and 21160. Should the results of landfill gas monitoring indicate concentrations of methane in excess of the standards of § 20921, control measures will be implemented pursuant to § 20937. Landfill gas monitoring has not been conducted to date, and the presence of methane in excess of the standards of § 20921 has not been established. The requirements of these CIWMB regulations are summarized in Table 4.

2.11.3 Cost Effectiveness

Alternative 2 is considered cost effective because its costs are proportional to its overall effectiveness. Overall effectiveness is measured by evaluating the following three of the five primary balancing criteria for remedy selection, as provided by 40 CFR Section 300.430(f)(1)(ii)(D) of the NCP: (1) long-term effectiveness and permanence; (2) reduction in toxicity, mobility and volume through treatment; and (3) short-term effectiveness. Once this is determined for each alternative, then overall effectiveness for each alternative is compared with cost individually, and the cost and effectiveness of alternatives are compared with one another.

Although Alternatives 2 and 3 will not reduce toxicity, mobility, and volume through treatment, the EPA presumptive remedy for landfills does not require this reduction because treatment of contamination sources within landfills is typically not practical.

By evaluation of the remaining two balancing criteria, Alternative 2 is considered effective. It is effective in the long term because with proper implementation the native soil cap will permanently isolate contaminants from humans and the environment, and there is no evidence that groundwater contamination is emanating from the landfill. Institutional controls can be easily enforced to prevent disturbance of the landfill cover because Site 1 is on Navy property with restricted public access. Alternative 2 is effective in the short term because it can be implemented in a matter of months and it will be well isolated from the public during construction of the cap.

The overall effectiveness is related to the cost of implementing this alternative. An NPV of \$2.8 million is reasonable for capping a landfill of the size of the Tidal Area Landfill. Thus, Alternative 2 is cost effective.

Similarly, Alternative 3 is also considered effective overall. It is judged effective in the long term at isolating contaminants from human and animal exposure. It is highly effective because it sheds virtually all rainfall from the landfill. Although the multilayer cap is considered stable when static, there is some potential for instability during earthquakes because the multilayer cap is heavy. It is also effective in the short term because access to the public will be restricted while the remedy is being implemented and it can be implemented in a relatively short time. Furthermore, this overall effectiveness bears a reasonable relationship to the cost for implementing the alternative. In summary, Alternative 3 is cost effective.

When compared to one another, Alternative 2 is considered more cost effective than Alternative 3. Alternative 2 is slightly more effective overall because it satisfies the RAOs in the long term (isolating the wastes from exposure to humans and ecological receptors) with slightly greater structural stability and increased short term effectiveness because it can be implemented more quickly than Alternative 3. Moreover, Alternative 2 achieves this at a significantly reduced cost over Alternative 3. Although the performance of Alternative 2 is only marginally superior to that of Alternative 3, Alternative 2 is available at a capital cost of 36 percent less than the cost of Alternative 3. As a result, Alternative 2 is judged significantly more cost effective than Alternative 3.

2.11.4 Utilize Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be applied in a cost-effective manner. In accordance with EPA's presumptive remedy for CERCLA landfill sites, the selected remedy is effective for long-term protection of human health and the environment. Refuse and leachate at the Tidal Area Landfill will be isolated from human and environmental receptors through capping, and to a lesser degree, through implementation of institutional controls including access and land use restriction notations within the IMP or an equivalent planning document. Changes in groundwater quality will be tracked through the groundwater monitoring program.

Implementation of the selected remedy will eliminate future exposures to human and current and future exposures to ecological receptors by (1) minimizing direct contact with landfill contents, (2) minimizing infiltration, (3) preventing inhalation of contaminated dust, and (4) minimizing erosion and runoff through revegetation and grading. In addition, in-place containment of the contents of the landfill minimizes the potential spread of contaminants off site.

2.11.5 Preference for Treatment as a Principal Element

Alternative 2 does not involve treatment to reduce toxicity, mobility, or volume. Treatment options for refuse in the landfill are not considered because hot spots do not pose immediate and elevated threats to human health and the environment. Treatment of hot spots is impractical for landfills that present a low-level threat (EPA 1991). However, isolating and thereby reducing infiltration through refuse with a cap will help to reduce the likelihood that leachate will form and the mobility of contamination at the Tidal Area Landfill.

2.12 DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes occurred after the public comment period.

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TABLES

TABLE 1

**CHEMICAL-SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Requirement	Prerequisite	Citation	ARAR Determination	Comments
The concentration of methane at the landfill boundary shall not exceed the LEL (5 percent methane in air)	Landfill closure	Cal. Code Regs. Tit. 27 Sec. 20921(a)(2) and (a)(3)	Applicable	These regulations are applicable to the landfill because landfill gas containing methane may be present at the landfill.

TABLE 2

FEDERAL LOCATION-SPECIFIC ARARs

RECORD OF DECISION FOR THE TIDAL AREA LANDFILL

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Executive Order 11988, Protection of Floodplains*					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain (that is, lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 CFR § 6.302(b)	To Be Considered	Installation of a native soil cap will not adversely affect the floodplain.
Endangered Species Act of 1973* (16 USC §§1531–1543)					
Habitat upon which endangered species or threatened species depend	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	Determination of effect upon endangered or threatened species or its habitat. Critical habitat upon which endangered species or threatened species depend.	16 USC §1536(a), (h)(1)(B)	Relevant and Appropriate	Both endangered and threatened species are known to reside within or near the Tidal Area, so the remedial action must be conducted so as to conserve endangered species including the salt marsh harvest mouse

TABLE 2 (Continued)

**FEDERAL LOCATION-SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Coastal Zone Management Act* (16 USC §§1451–1464)					
Within coastal zone	Conduct activities in a manner consistent with approved state management programs.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	16 USC § 1456(c) 15 CFR § 930	Relevant and appropriate	Remedial action at the Tidal Area Landfill could affect the coastal zone.

Notes:

* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs

ARAR Applicable or relevant and appropriate requirement
CCR *California Code of Regulations*
CFR *Code of Federal Regulations*
§ Section
U.S. United States
USC *United States Code*

TABLE 3

**STATE LOCATION-SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
California Endangered Species Act (California Fish and Game Code §§ 2050–2116)					
Endangered species habitat	No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Threatened or endangered species determination on or before 01 January 1985 or a candidate species with proper notification.	Cal. Fish and Game Code § 2080	Relevant and appropriate	California threatened and endangered species are known to occur within or near the Tidal Area and will be protected in conducting the remedial actions
Wildlife area	Prohibits taking birds or mammals with a net, pound, cage, trap, setline, wire, or poisonous substance or possessing birds or mammals except as provides	Presence of birds and mammals	Cal. Fish and Game Code § 3005(a) and § 3511	Relevant and appropriate	Although the taking of such species is not anticipated during the landfill capping remedy, this ARAR has been included to protect wildlife species in the vicinity of the landfill
Areas with Protected Birds	Provides that fully protected birds, including the California Clapper Rail or parts thereof, many not be taken or possessed at any time except under special circumstances	Presence of protected birds	Cal. Fish and Game Code § 2080	Relevant and appropriate	Although the taking of such species is not anticipated during the landfill capping remedy, this ARAR has been included to guard against the taking of protected birds, which may live in the vicinity of the landfill

TABLE 3 (Continued)

**STATE LOCATION-SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comments
Waters of the State	Prohibits the deposition of toxic materials into waters of the state that would have a deleterious effect on species or habitat		Cal. Fish and Game Code § 5060(a), (b), and (f)	Relevant and appropriate	Although landfill leachate formation has not been detected and proposed capping remedies would further limit leachate formation, this ARAR is included to protect aquatic habitat and species. The landfill is located within a low-elevation marsh and groundwater elevations are typically at or below sea level.
McAteer-Petris Act of 1965*					
San Francisco Bay	Permit requirements for placing fill, dredging or extracting materials from the Bay bottom, subdividing property, or grading and/or changing the use of any land, water, or structure within the Bay.	Listed activities in San Francisco Bay.	Cal. Government Code §§ 66600–66687	Relevant and appropriate	Remedial action at the Tidal Area Landfill could affect the coastal zone

Notes:

* statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs follow each general heading; only substantive requirements of the specific citations are considered potential ARARs

ARAR	Applicable or relevant and appropriate requirement
CCR	<i>California Code of Regulations</i>
Cal.	California
Cal. Pub. Res. Code	California Public Resources Code
§	Section

TABLE 4

**STATE ACTION SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
State Water Resources Control Board*					
Landfill capping	Alternatives to construction or prescriptive standards.	Cal. Code Regs. tit. 27 requirements are only applicable for waste discharged after 18 July 1997 unless otherwise noted.	Cal. Code Regs. tit. 27, §§ 20080(b) and (c) and 21090	Relevant and appropriate	The native soil cap design will provide similar protection against water quality impairment as SWRCB prescriptive landfill closure standards.
	General construction criteria and general criteria for containment structures.	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, §§ 20310 and 20320	Relevant and appropriate	Standards for construction and containment may be relevant and appropriate to closure of the Tidal Area Landfill.
	Provides specific standards for closure and post-closure of landfills	Waste discharged after 18 July 1997	Cal. Code Regs. tit. 27, § 21090	Relevant and appropriate	Specific standards for closure and post-closure of landfills are relevant and appropriate to closure of the Tidal Area Landfill
	Contains general standards for the design of the final cover	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, §21140(a) and (b)	Applicable	The native soil cover will be designed to function with minimal maintenance and to control vectors, prevent exposure to landfill contents, ensure stability and integrity of the cover.
	Contains general standards for landfill grading	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, § 21142(a)	Applicable	The native soil cover will be designed to function with minimal maintenance and to control vectors, prevent exposure to landfill contents, ensure stability and integrity of the cover.

TABLE 4 (Continued)

**STATE ACTION SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Landfill capping	Contains general standards for slope stability	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, § 21145(a)	Applicable	The native soil cover will be designed to function with minimal maintenance and to control vectors, prevent exposure to landfill contents, ensure stability and integrity of the cover.
	Contains general standards for drainage and erosion control	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, § 21150(a) and (b)	Applicable	The native soil cover will be designed to function with minimal maintenance and to control vectors, prevent exposure to landfill contents, ensure stability and integrity of the cover.
Closure of a waste management unit	General closure and postclosure maintenance standards	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, § 20950(a) (b), (d), and (e)	Relevant and appropriate	General performance standards for closure and post-closure of solid waste landfills including surveying monuments and revegetation, are relevant and appropriate because the landfill received municipal solid waste
Landfill closure	Classified waste management units shall be closed in accordance with an approved closure and post-closure maintenance plan, which provides for continued compliance with the applicable standards for waste containment and precipitation and drainage controls and monitoring requirements.	Waste discharged after 18 July 1997.	Cal. Code Regs. tit. 27, § 21769	Relevant and appropriate	Preparation of closure and post-closure maintenance plans are procedural requirements. However the design documents for the remedial response will document how the substantive requirements will be met.

TABLE 4 (Continued)

**STATE ACTION SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Monitoring	Persons responsible for discharges at units that were closed, abandoned, or inactive on or before 27 November 1984 may be required to develop and implement a monitoring program in accordance with subdiv. 1, subch. 3, art. 1, (Cal. Code Regs. tit 27, §§ 20380–20435).	Closed, inactive, or abandoned waste management unit before November 27, 1984.	Cal. Code Regs. tit. 27, § 20080(g)	Applicable	RWQCB's request that the Navy implement a detection monitoring program under 27 CCR makes these requirements applicable to closure of the landfill.
	Requires detection monitoring. Once a significant release has occurred, evaluation or corrective action monitoring is required.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20385(a)(1) and (a)(2)	Applicable	Detection monitoring will be implemented.
Groundwater monitoring	Requires identification of the point of compliance, hydraulically downgradient from the area where waste was discharged to land.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20405	Applicable	RWQCB's request that the Navy implement a detection monitoring program under 27 CCR makes these requirements applicable to closure of the landfill.
	Requires monitoring for compliance with remedial action objectives for 3 years from the date of achieving cleanup levels.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20410	Applicable	RWQCB's request that the Navy implement a detection monitoring program under 27 CCR makes these requirements applicable to closure of the landfill.
	Requires general soil, surface water, and groundwater monitoring.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20415	Applicable	RWQCB's request that the Navy implement a detection monitoring program under 27 CCR makes these requirements applicable to closure of the landfill.

TABLE 4 (Continued)

**STATE ACTION SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Groundwater monitoring	Provides minimum requirements for a groundwater detection monitoring program.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20420	Applicable	.RWQCB's request that the Navy implement a detection monitoring program under 27 CCR makes these requirements applicable to closure of the landfill.
	Requires evaluation monitoring once a significant release is detected.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20425	Applicable	This requirement will be applicable if a release occurs.
Corrective action	Requires implementation of corrective action measures that ensure that cleanup levels are achieved throughout the zone affected by the release by removing the waste constituents or treating them in place. Source control may be required. Also requires monitoring to determine the effectiveness of the corrective actions.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20430 except § 20430(g)(2)	Applicable	This requirement will be applicable in the event that detection and evaluation monitoring shows evidence that a new release has occurred.
	Requires demonstration of completion of the corrective action to include eight evenly distributed sampling events throughout the year.	Discharge of waste to land after 18 July 1997.	Cal. Code Regs. tit. 27, § 20430(g)(2)	Applicable	This requirement will be applicable in the event that detection and evaluation monitoring shows evidence that a new release has occurred.

TABLE 4 (Continued)

**STATE ACTION SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Landfill gas monitoring	Allows for exemptions from the landfill gas monitoring requirements based on a showing that there is no potential for adverse impacts on public health and safety and the environment		Cal. Code Regs. tit.27, § 20918	Applicable	This requirement is applicable to the landfill because it was not completely closed in accordance with all applicable requirements.
	Contains general standards for a landfill gas monitoring network		Cal. Code Regs. tit.27, § 20923	Applicable	This requirement is applicable to the landfill because it was not completely closed in accordance with all applicable requirements
	Describes the location, spacing, depth, and constructions requirements for a perimeter monitoring system		Cal. Code Regs. tit.27, § 20925	Applicable	This requirement is applicable to the landfill because it was not completely closed in accordance with all applicable requirements
	Provides that monitoring probes be sampled for methane		Cal. Code Regs. tit.27, § 20932	Applicable	This requirement is applicable to the landfill because it was not completely closed in accordance with all applicable requirements
	Establishes the monitoring frequency for landfill gas monitoring		Cal. Code Regs. tit.27, § 20933	Applicable	This requirement is applicable to the landfill because it was not completely closed in accordance with all applicable requirements
	Describes actions to be taken if the results of landfill gas monitoring indicate concentrations of methane in excess of levels set forth in Section 20921(a)		Cal. Code Regs. tit.27, § 20937	Applicable	This requirement is applicable to the landfill because it was not completely closed in accordance with all applicable requirements

TABLE 4 (Continued)

**STATE ACTION SPECIFIC ARARs
RECORD OF DECISION FOR THE TIDAL AREA LANDFILL
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD, CONCORD, CALIFORNIA**

Notes:

- * Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the Navy accepts the entire statutes or policies as potential ARARs; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific actions are considered potential ARARs.

ARAR	Applicable or relevant and appropriate requirement
CAI	Closed, abandoned, or inactive
CCR	<i>California Code of Regulations</i>
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
USC	<i>United States Code</i>

TABLE 5

**COST ESTIMATE SUMMARY FOR SELECTED ALTERNATIVES
TIDAL AREA LANDFILL, NAVAL WEAPONS STATION SBD CONCORD**

Alternative	Capital Cost	Annual O&M Cost ^a	Total NPV Cost ^b
1 – No Action ^c	\$34,000	\$66,700	\$453,000
2 – Native Soil Cap	\$2,401,000	\$75,000	\$2,833,000
3 – Multilayer Soil Cap	\$3,794,000	\$75,000	\$4,226,000

Notes:

- a Annual O&M cost during the first five years. Annual O&M cost assumes quarterly groundwater and landfill gas monitoring for the first 5 years and annual monitoring for the next 25 years.
- b Total NPV cost includes capital costs and NPV of annual O&M cost. Present value calculated based on a 7 percent discount rate.
- c The “No Action” alternative includes costs for groundwater and landfill gas monitoring.
- NPV Net present value
- O&M Operation and maintenance

APPENDIX A

RESPONSIVENESS SUMMARY

FOR THE TIDAL AREA LANDFILL PROPOSED PLAN

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD

(5 Pages)

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3.3 COMMENTS FROM DAVID COOPER, EPA REGION IX COMMUNITY RELATIONS SPECIALIST.....	A-4

1.0 OVERVIEW

In June 1999, the Navy presented the “Tidal Area Landfill Proposed Plan” for Naval Weapons Station Seal Beach, Detachment Concord (NWSSB Detachment Concord), to the public. The proposed plan described the Navy’s proposed approach to addressing contamination at the Tidal Area Landfill. Environmental conditions at the Tidal Area Landfill had been investigated as part of the Navy’s Installation Restoration Program, a comprehensive environmental investigation and cleanup program that mirrors the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

A 30-day public comment period on the proposed plan was held from June 8, 1999, to July 8, 1999. A public meeting was held to present the proposed plan and receive public comment on June 17, 1999. Notice of the public comment period and public meeting was provided to the community mailing list and publicized in the *Contra Costa Times*. No written comments were received on the proposed plan; however, oral comments were received from two community members and one regulatory agency representative at the June 17 public meeting.

CERCLA requires that a responsiveness summary be prepared following the public comment period. The responsiveness summary must present significant community comments on the Navy’s proposed cleanup alternative presented in the proposed plan, and the Navy’s responses to those comments. This responsiveness summary has been prepared to fulfill the requirements of CERCLA.

The selected approach to addressing the Tidal Area Landfill is described in the record of decision; it is the same as the preferred approach described in the proposed plan.

Section 2.0 of this document presents background information on the community involvement programs at NWSSB Detachment Concord. Section 3.0 presents significant public comments received at the June 17, 1999, meeting on the proposed plan and the Navy’s responses.

2.0 BACKGROUND ON COMMUNITY INVOLVEMENT

The Navy has conducted an active community involvement program at Naval Weapons Station SBD Concord since 1989 and has initiated a wide range of activities. Numerous open houses, site tours, and community meetings have been held to explain the environmental investigation and cleanup process and solicit community input on the Navy's approach. Fact sheets have been sent to a community mailing list that includes elected officials, community organizations and interest groups, residents, and local businesses.

A community relations plan (CRP) for Naval Weapons Station SBD Concord was prepared in February 1996. The CRP presents an outreach program to inform and involve the community in the cleanup decision-making process. An information repository has been established to provide public access to detailed information regarding environmental cleanup activities at NWSSB Detachment Concord. The repository is located at Central Library/Pleasant Hill, Contra Costa County Library, 1750 Oak Boulevard, Pleasant Hill, California. Additionally, an administrative record has been established at the library that includes documentation to support final decisions on how to address sites undergoing environmental investigations and cleanup at NWSSB Detachment Concord. Both the information repository and administrative record are available for public review.

The Navy has also established a restoration advisory board (RAB) composed of community members to provide a forum for ongoing dialogue among the Navy, regulatory agencies, and the community on environmental cleanup issues at Naval Weapons Station SBD Concord. The RAB includes a wide range of community members. The goal of the RAB is to advise the Navy on its cleanup approach and to review and comment on environmental cleanup documents. RAB meetings are held as needed at the Clyde Community Center, and are open to the public.

3.0 PUBLIC COMMENTS AND THE NAVY'S RESPONSES

Following is a summary of significant comments and questions raised during the public meeting that was conducted by the Navy on June 17, 1999. The purpose of the public meeting was to (1) present the proposed plan for the Tidal Area Landfill to the community, (2) receive community comments on the proposed plan, and (3) respond to questions. Two community members and one regulatory agency representative raised questions during the public meeting; their questions and the Navy's response are summarized below. All questions focused on the technical aspects of the proposed remedy for the landfill.

No written comments were received during the 30-day public comment period.

3.1 COMMENTS FROM STEVE GALLO, COMMUNITY CO-CHAIR

1. Question: Will the Navy develop a maintenance plan to monitor the integrity of the proposed remedy?

Response: Yes, the Navy will develop a long-term operation and maintenance plan to inspect the landfill cap and monitor adjacent groundwater for contamination, as well as to monitor for the unlikely possibility of landfill gas seepage from the landfill.

2. Question: Is the cap so impermeable that gas may seep out? Are there any potential difficulties in capturing the gas?

Response: The landfill is not expected to generate much landfill gas because it is so old; most of the organic contents have already decomposed to such an extent that little landfill gas is expected to be generated. A landfill gas assessment is required to assess the anticipated quantity of landfill gas currently being generated by the landfill. Landfill gas generation is a design consideration and the results of the landfill gas assessment will be incorporated in the design of the landfill cap.

3. Question: Because there are voids and uneven surfaces at the landfill (due to decomposed organic materials), how is the Navy planning to protect the landfill from sink holes that may develop in the future?

Response: The landfill surface will be leveled and compacted to remove void areas. Most of the wastes likely to decompose and create void space have already done so. Ongoing or future degradation will be considered in the final engineering design for the landfill cap. The design will also address the potential for settlement or compression of materials. Unanticipated sinkholes would be identified during the required 30-year maintenance period as a result of routine inspections. If sinkholes develop and are judged to require repair, the landfill surface can be locally repaired and regraded as necessary.

3.2 COMMENTS FROM KARL YOCUM, community member

1. Question: What is the thickness of the proposed landfill cap?

Response: The cap will be approximately 3 feet thick.

2. Question: How will the landfill cap be sealed with the bay mud?

Response: The details of the construction to seal the cap at the landfill boundary with the underlying Bay Mud have not been established, but are an important consideration for the detailed engineering design. The design is expected to extend the relatively impermeable landfill cap down to the relatively impermeable Bay Mud. The purpose is to restrict the flow of landfill leachate so it will not pass freely to and from the landfill regardless of the elevation of surface water outside the landfill.

3.3 COMMENT FROM DAVID COOPER, EPA REGION IX COMMUNITY RELATIONS SPECIALIST

1. Question: What is the difference in weight and height between the Navy's preferred native soil cap option (Option 2) and an alternative multilayer cap option (Option 3) in the proposed plan?

Response: The Option 3 cap is several feet thicker than the Option 2 cap and is estimated to be roughly twice as heavy. The estimated thicknesses of the Option 2 and Option 3 caps are approximately 3.5 feet and 6.5 feet, respectively, with a relative difference of approximately 3 feet. The relative difference in weight per square foot is approximately 400 pounds. Option 3 is also substantially more expensive than Option 2 (roughly \$1.4 million more). Option 3 is more difficult and time-consuming to implement and would also be less effective over the long term because the added weight would cause additional settling of wastes below the water table.

It is important to point out that any coverage of the landfill is a significant improvement over the current situation. The existing landfill is completely exposed, with large voids or sink holes that function as conduits for rainwater infiltration into the landfill. Studies conducted at the landfill have not detected any contaminated water leaching from the landfill; however, the Navy believes it would be prudent to construct a native soil cap over the landfill to minimize the infiltration of rainwater and reduce the generation of potentially contaminated leachate.

APPENDIX B
DETAILED COST ESTIMATE FOR ALTERNATIVE 2

(2 Pages)

LOCATION: Weapons Support Facility Seal Beach, Detachment Concord Concord, California		SPEC NO: Not Final									
		ORIGINATOR OF OPINION: FIRM: Levine-Fricke-Recon		BXW	CHECKED BY: FIRM: Levine-Fricke-Recon		EBK	DATE: 5/1/1998			
PROJECT TITL Weapons Support Facility Seal Beach, Detachment Concord Feasibility Study, Alternative 2: Native Soil Cap		SUBMITTAL STATUS Draft Final			EFA WEST DELIVERY ORDER NO: CTO No. 032						
Description		Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Opinion Total Unit Cost	Opinion Total Cost
Grand Total (Total NPV)					\$1,613,494		\$474,390		\$845,138		\$2,833,000
Total Capital Costs					\$1,114,577		\$447,684		\$638,510		\$2,401,000
Total Direct Costs					\$619,965		\$331,259		\$722,183		\$1,673,407
Total Engineering Costs					\$401,618		\$66,836		\$8,000		\$476,554
Contingency (on Direct Costs Only) (15%)					\$92,995		\$49,689		\$108,327		\$251,011
Total Annual O&M Costs for First 5 Years					\$69,230		\$4,800		\$1,150		\$75,000
Total O&M costs					\$60,200		\$4,000		\$1,000		\$65,200
Contingency (15%)					\$9,030		\$800		\$150		\$9,780
Net Present Value (NPV) O&M Costs for First 5 Years					\$283,857		\$18,881		\$4,715		\$307,433
Total Annual O&M Costs for Next 25 Years					\$13,648		\$920		\$230		\$16,000
Total O&M costs					\$12,040		\$800		\$200		\$13,040
Contingency (15%)					\$1,808		\$120		\$30		\$1,958
NPV O&M Costs for Next 25 Years					\$115,060		\$7,645		\$1,911		\$124,617
NPV O&M Costs for Total 30 Years					\$398,917		\$26,506		\$6,627		\$432,080
33 Hazardous Toxic, and Radioactive Waste											
33.01 Mobilization and Demobilization					\$450		\$4,400		\$550		\$5,400
33.01.01 Mob/Demob of Construction Equipment and Facilities					\$450		\$1,300		\$550		\$2,300
33.01.01.90 Mob/Demob of Construction Equipment and Facilities		1	ls			\$900	\$900			\$900	\$900
33.01.01.91 Mob/Demob of Drill Rig and Crew		1	ls	\$450	\$450	\$400	\$400	\$550	\$550	\$1,400	\$1,400
33.01.04 Setup/Construct Temporary Facilities					\$0		\$3,100		\$0		\$3,100
33.01.04.04 Decontamination Facilities for Personnel		1	ls			\$500	\$500			\$500	\$500
33.01.04.06 Decontamination Facilities Const. Equipment and Vehicles		1	ls			\$1,500	\$1,500			\$1,500	\$1,500
33.01.04.24 Fencing		1	ls			\$600	\$600			\$600	\$600
33.01.04.28 Signs		1	ls			\$500	\$500			\$500	\$500
33.02 Monitoring, Sampling, Testing and Analysis					\$87,200		\$9,200		\$6,400		\$82,800
33.02.04 Monitoring Wells					\$7,000		\$5,200		\$5,400		\$17,600
33.02.04.90 Groundwater Monitoring Well Construction		2	each	\$1,500	\$3,000	\$1,000	\$2,000	\$900	\$1,800	\$3,400	\$8,800
33.02.04.91 Landfill Gas Monitoring Well Construction		4	each	\$1,000	\$4,000	\$800	\$3,200	\$900	\$3,600	\$2,700	\$10,800
33.02.06 Sampling Surface Water/Groundwater/Liquid Waste					\$13,200		\$4,000		\$1,000		\$18,200
33.02.06.02 Sampling Groundwater (annual)		4	quarter	\$2,750	\$11,000	\$500	\$2,000	\$250	\$1,000	\$3,500	\$14,000
33.02.06.90 Sampling Landfill Gas (annual)		4	quarter	\$300	\$1,200	\$250	\$1,000		\$0	\$550	\$2,200
33.02.06.91 Cap Maintenance (annual)		1	year	\$1,000	\$1,000	\$1,000	\$1,000			\$2,000	\$2,000

LOCATION: Weapons Support Facility Seal Beach, Detachment Concord Concord, California			SPEC NO: Not Final									
			ORIGINATOR OF OPINION: BXW FIRM: Levine-Fricke-Recon		CHECKED BY: EBK FIRM: Levine-Fricke-Recon		DATE: 5/1/1998					
PROJECT TITL Weapons Support Facility Seal Beach, Detachment Concord Feasibility Study, Alternative 2: Native Soil Cap			SUBMITTAL STATUS Draft Final			EFA WEST DELIVERY ORDER NO: CTO No. 032						
Description			Quantity Amount	Quantity Unit	Labor Unit Cost	Labor Total Cost	Equipment Unit Cost	Equipment Total Cost	Material Unit Cost	Material Total Cost	Opinion Total Unit Cost	Opinion Total Cost
33.02.09 Laboratory Chemical Analysis						\$47,000		\$0		\$0		\$47,000
33.02.09.90 Groundwater/Leachate Analyses (annual)			44	each	\$1,000	\$44,000					\$1,000	\$44,000
33.02.09.91 Landfill Gas Analyses (annual)			20	each	\$150	\$3,000					\$150	\$3,000
33.03 Site Work						\$595,475		\$296,279		\$682,373		\$1,674,127
33.03.03 Earthwork						\$120,000		\$0		\$0		\$120,000
33.03.03.90 Precontouring			20	acre	\$6,000	\$120,000	\$0.00	\$0	\$0	\$0	\$6,000.00	\$120,000
33.03.05 Fencing						\$10,405		\$5,879		\$29,775		\$46,059
33.03.05.01 Fencing			3,300	feet	\$3.00	\$9,900	\$1.68	\$5,544	\$8.85	\$29,205	\$13.53	\$44,649
33.03.05.02 Gates			1	each	\$505	\$505	\$335	\$335	\$570	\$570	\$1,410	\$1,410
33.03.12 Permanent Cover Structure Over Contaminated Area (Landfill Cap)						\$485,070		\$290,400		\$652,598		\$1,408,068
33.03.12.90 Three-foot Vegetative Layer (Native Soil)			96,800	cy	\$3.00	\$290,400	\$3.00	\$290,400	\$3.40	\$329,120	\$9.40	\$909,920
33.03.12.91 6-inch Biotic Barrier (Gravel)			18,150	cy	\$5.00	\$90,750	\$0.00	\$0	\$16.25	\$262,438	\$21.25	\$343,188
33.03.12.92 Filter Fabric			872,000	sq. feet	\$0.06	\$52,320	\$0	\$0	\$0.07	\$61,040	\$0.13	\$113,360
33.03.12.93 Access Road			1,600	feet	\$26.00	\$41,600		\$0		\$0	\$26.00	\$41,600
33.07 Air Pollution						\$16,000		\$24,000		\$8,000		\$48,000
33.07.04 Fugitive Dust						\$16,000		\$24,000		\$8,000		\$48,000
33.07.04.04 Water Spraying			18	weeks	\$1,000	\$18,000	\$1,500	\$24,000	\$500	\$8,000	\$3,000	\$48,000
33.20 Site Restoration						\$1,040		\$1,380		\$25,860		\$28,280
33.20.04 Revegetating and Planting						\$1,040		\$1,380		\$25,860		\$28,280
33.20.04.01 Seeding/Mulch/Fertilizer			20	acre	\$52	\$1,040	\$69	\$1,380	\$1,293	\$25,860	\$1,414	\$28,280
33.99 Distributive Costs						\$401,618		\$66,936		\$8,000		\$476,554
33.99.01 Construction Supervision/Management						\$167,341		\$0		\$0		\$167,341
33.99.01.90 Construction Supervision/Management (10% of direct costs)			1	ls	\$167,341	\$167,341		\$0		\$0	\$167,341	\$167,341
33.99.04 Engineering (Design, Permitting and Manifesting)						\$167,341		\$0		\$0		\$167,341
33.99.04.90 Engineering (Design, Permitting and Manifesting) (10% of direct cost)			1	ls	\$167,341	\$167,341		\$0		\$0	\$167,341	\$167,341
33.99.15 Health and Safety						\$66,936		\$66,936		\$8,000		\$141,873
33.99.15.17 Personal Protective Equipment			16	weeks					\$500	\$8,000	\$500	\$8,000
33.99.15.90 Health and Safety Monitoring and Personnel (4% of direct costs)			1	ls	\$66,936	\$66,936	\$66,936	\$66,936		\$0	\$133,873	\$133,873